Energy, Mines and Resources Canada
Énergie, Mines et Ressources Canada

Report on Seminar:

"Energy Conservation - Retrospect and Prospect"

(2 DECEMBER 1981)

Submitted to Conservation and Oil Substitution Branch

By Middleton Associates
Ottawa

REPORT ON SEMINAR:

"ENERGY CONSERVATION -- RETROSPECT AND PROSPECT"

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RETROSPECT AND PROSPECT

1. INTRODUCTION

1.1 Background

Energy Conservation has been a policy and program area for Energy, Mines and Resources Canada for about seven years. During that time, conservation can be said to have gone through its "first generation". Programs in all energy-use sectors, and at all levels of government, have achieved varying degrees of success. This success can be gauged not only from estimates of energy savings, but also from changes in values, attitudes, and policy priorities.

Conservation is now entering a new phase. The 1980 National Energy Program provides a clarification of federal energy policy over the next decade. The Ottawa-Alberta oil and gas pricing accord of 1981 ensures an environment of substantial (and predictable) increases in real energy prices over at least the next few years -- an environment much more favorable to conservation than the uncertain pricing arrangements of the recent past.

These and other developments have created a need for a review of progress in conservation over the last decade, and a need to begin charting new policy and program directions for energy conservation in the 1980's.

The topics proposed for this seminar were:

1. A review of the last 10 years in energy conservation.

2. Evidence of the economic potential for energy conservation.

3. A discussion to characterize the benefits of conservation not only in terms of energy saved vs. the cost of saving it, but also in terms of industrial opportunities and other economic factors.

4. A discussion to propose new methods, institutions and approaches to energy conservation for the future.

The intended results of the seminar were seen as being:

1. a start at re-defining conservation potential and benefits (especially vis-à-vis new price structures);

2. a clarification of important policy and program options for Energy, Mines and Resources Canada;

3. a highlighting of new opportunities and roles for private companies, utilities, other levels of government and institutions;

4. a greater consensus on where Canada should be heading in energy conservation;

5. the identification of key themes for further research, development and implementation;

In selecting speakers and participants, there was need to strike a balance among a number of groups including private industry, utilities, and public interest groups, as well as among various regions of the country. Eventually, more than 100 invitations were issued, and 73 participants attended the seminar. A list of all those attending is reproduced in this report as Appendix B.

The arrangement with repect to financing was that, although no registration fee was charged, the seminar was open by invitation only and participants and speakers (excluding the keynote speaker) were responsible for their own travel and accomodation expenses. Simultaneous translation service was provided through Energy, Mines and Resources Canada.

As background to the seminar, a discussion paper was prepared in consultation with the Energy Conservation and Oil Substitution Branch. The paper attempted to recapitulate the lessons learned over the past several years in energy conservation, and to set out a number of issues for the future. It was mailed to participants about two weeks before the date of the seminar as part of a seminar kit containing several additional items of background information. The background paper is reproduced as Appendix C.

2. POINTS OF DISCUSSION

This section provides a summary of key points raised in discussion during the seminar. In addition, Appendix D includes, for most speakers, either the text of their presentation or the speaking notes on which their talks were based.

2.1 Conservation Potential

A number of points of general agreement emerged during the seminar. There seems little dispute, for instance, about the economic attractiveness (from an overall, society wide point of view) of higher levels of energy conservation. Similarly, there is little disagreement about the potential business opportunities in conservation related fields.

Keynote speaker Roger Sant, an energy consultant from the Mellon Institute, emphasized that competitiveness with new energy supplies is a driving force in making energy conservation attractive to entrepreneurs. He suggested that this attractiveness may be sufficient to overcome other impediments to the rapid spread of conservation technologies. Frank Henkelman, of Fiberglas Canada Inc., noted that his company's insulation market has grown from $60 million in 1971 to $325 million in 1981. However, he observed that sales growth in industrial and commercial markets (unlike the growth in residential insulation sales) is probably not due to increased emphasis on energy conservation, but to general economic pressures. Richard Willingham, Editor of Energy Management Canada, suggested that the conservation-related market will expand significantly from now until the end of the decade.

It is clear that we have only begun to tap the potential for more efficient use of energy. Graham Armstrong, of the Energy Conservation and Oil Substitution Branch, observed that probably less than 25 percent of Canada's current cost-effective conservation potential has been tapped. Fred Heal, of Saskatchewan's Office of Energy Conservation, stated that, despite steady progress, numerous problems crop up between design and application, as shown by the history of super energy-efficient building programs in Saskatchewan. These problems have involved not only technical performance, but also market-ability.

Carl Wolf, of Union Carbide Canada Ltd., confirmed an earlier UCCL forecast that industrial energy-efficiency would double between 1972 and 2000. Indeed, he said that goal might be achieved much sooner. (The actual improvement in energy efficiency between 1972 and 1980 was 15.4%) Peter Reilly-Roe, of Energy, Mines and Resources, stated that although major progress has been made in reducing vehicle fuel consumption, still further improvements are possible, particularly in improving on-road fuel economy. The improvements already made will take time to work their way through the vehicle fleet.

2.2 Obstacles to Conservation

Despite the obvious conservation potential, a number of problems which merit more policy attention exist. These were discussed in the course of workshop sessions and informal discussion.

2.2a Information

Perhaps the most frequently raised issue was that of inadequate, confusing or conflicting information. Household consumers may not be getting the right "signals" on conservation vs. substitution. For the householder, information availability may still be a problem. This information problem, as Graham Armstrong later pointed out with a trace of frustration, exists despite the masses of material made available by Energy, Mines and Resources Canada and other agencies over the past several years.

Where information availability is not a problem, information reliability may still be questionable. Fred Heal quoted as something of an exaggeration the remark that "UFFI is the conservationist's Three Mile Island." Although Canada is the leading country dealing with the ureaformaldehyde foam insulation problem (along the 15 countries who have used UFFI), it was seen by several participants as a problem whose effects may be felt for sometime.

There was some disagreement over the role of government in providing information. One participant observed that demands for reliable information have, in at least one province, placed government in the role of a reluctant arbiter among conflicting cost claims by proponents of gas and electric off-oil conversions. Some felt government's role in the provision of such information should be minimal, while others argued that government has a major responsibility to provide information in this area. But will government necessarily provide unbiased information? And will it be believed? One pragmatic suggestion on how to address this problem was that conservation information should be provided by whoever has the highest credibility in a particular market--governments, utilities, or the private sector.

The information crisis is not confined to the residential sector. In the transportation sector, fuel consumption under real (cold, windy) conditions is considerably higher than that cited in ratings based on tests under ideal conditions. The plant manager at the commercial or industrial level may be confronted by dozens of competing manufacturers with exciting (but untested!) claims.

2.2b Conflicting Priorities

The assumption is often made that any conservation investment that looks attractive to the analyst will, even "should", be made. This assumption ignores, to begin with, the widely differing paybacks and rates of return demanded in different sectors.

Sometimes, these differences may be hard to understand or justify. For instance, Richard Willingham pointed out that many conservation investments that homeowners are now being urged to make have a far longer payback time that industrial or commercial users have been willing to accept on conservation investments.

However, other things are not often equal. And much of the discussion in the seminar served as a salutary reminder that most energy conservation decisions, like most investment decisions of any kind, are made in a context of competing priorities. Wayne Murchison, of Canada Mortgage and Housing Corporation, pointed out that especially in the current economic climate some homeowners simply may not be able to mobilize the additional capital to meet the additional cost of an energy-efficient new dwelling or the expense of retrofitting. Thus, tradeoffs are inevitable between conservation and (for instance) amount of interior space.

Similarly, other speakers pointed out that conservation, however "efficient" in economic terms, must inevitably compete with other purchases like travel, furnishings, and so on. It also has to compete in strict economic terms, as Mr. Murchison again reminded participants, with such other investments as paying off part of a 20% mortgage.

For industrial users, Carl Wolf warned that higher energy prices "will substantially increase their operating costs and thereby reduce cash flow"--meaning, paradoxically, that "conservation projects may be stalled due to lack of funding" since conservation must of necessity be only one of many corporate investment priorities.

One conflict which is not a priority conflict so much as an institutional one involves the split of conservation costs and benefits between building owners and building tenants, in both household and commercial sectors. Although no specific strategies for overcoming this obstacle were advanced, the need to do so was mentioned repeatedly by participants.

2.2c "Infant-Industry" Problems

The conservation market includes an extremely diverse collection of firms due in part, to its large size and rapid expansion. Many of these firms--in Richard Willingham's words--"are not really sure whether they are in it or out of it". His workshop presentation provided a useful view of the diversity of these industries: "Energy Management Canada has on its files over 2,000 companies which suply energy conservation products or services to the Canadian energy user."

The discussion of problems facing industries serving the conservation market centered on the importance of marketing. In one sense, this is another facet of the information problem. Energy users are still far from understanding the full potential of conservation as a way of cutting the cost of energy services. "Marketing conservation" means paying particular attention to the needs, perceptions and constraints of the energy user in a specific market sector, rather than focussing exclusively on the technological aspects of conservation.

Many factors affecting the conservation market, like interest rates and the supply of investment capital, may be beyond the control of the company trying to expand into the conservation market, or to expand its share of the market. But a presentation by Honeywell's Bill Bartlett made it clear that many obstacles to market penetration can be removed by paying attention to the priorities of potential customers. For a long time, he pointed out, Honeywell's energy saving devices were not marketed on the basis of their proven economic benefits, but on the basis of the improvements in building comfort they provided.

2.2d Lack of Emphasis on Implementation

David Brooks, the first director of the Office of Energy Conservation, noted that there are limited payoffs to further studies of "what would happen if" certain conservation measures were taken. There is a far greater need for information on "what happens when" various measures are introduced, and why certain things happen.

Implementing conservation programs is a complex task. For the government bureaucracies involved, Brooks argued, there are "Catch-22's" which are often invoked to stall conservation programs. And he argued, as well, that there are limits to how clearly the distinction between "technical fixes" and "lifestyle changes" can be made. Conservation, he said, cannot proceed without at least some attention to the now-neglected theme of a Conserver Society.

2.3 Suggested Policy Directions

From the viewpoint of the public sector, the most interesting aspect of the seminar involved the extent to which it generated suggestions or recommendations for additional program or policy initiatives that could help overcome some of the above obstacles.

Workshop speakers provided the lead in this respect. Frank Henkelman noted that a genuine free market in energy services along the lines envisioned by Roger Sant might be the ideal solution, but was unrealistic as a prescription for the immediate future. His prescription for the residential sector included: "an incentive program for builders which will increase the levels of energy efficiency to the demonstrated Saskatoon levels". The incentive would provide an opportunity to demonstrate new technologies, retrain builders and tradesman and determine a realistic level for eventual mandatory standards.

Carl Wolf, in addition to his duties with Union Carbide, serves as Chairman of the Coordinating Committee of Canada's Industrial Energy Conservation Task Forces. He argued that, in addition to higher energy prices, government financial assistance should be provided "to assure that reasonable energy conservation investments are not stalled due to capital shortages." He emphasized, as well, the importance of improving information flow and technical training and of continuing research and development efforts in energy conservation.

One participant argued that the income tax system might be used to create greater incentives for energy conservation. It was suggested however that changing the income tax system is a difficult process.

An exception to the general lack of new and concrete program undertakings was a presentation by Ray Nakamura of Canertech, indicating Canertech's plan of action. Mr. Nakamura was working from a paper prepared by Grey Hamilton, Vice President and Secretary of Canertech. It is clear from the paper and Mr. Nakamura's presentation that Canertech, Canada's alternative energy technology investment company, is prepared to move into the conservation field in a major way. Canertech will invest not only in the production of a broad range of conservation-related products and services, but also in energy-efficient new construction, energy audit services and "retrofit packaging". Noted Nakamura, "Our broad, long-term goal is to foster a strong Canadian industrial base for energy conservation technology".

It is not surprising that there was a relative absence of highly specific proposals. As workshop chairman Brian Kelly remarked, "It is tough solving the problems of the world in one day". But it is fair to say that a general consensus emerged on the importance of:

1. Improved information programs on conservation, in all sectors;

2. Additional incentives for conservation investment;

3. Policies to ensure that the conservation-related industries develop rapidly and healthily.

Additionally, a general consensus appeared to exist that one specific proposal noted in the discussion paper was not a good idea. It was felt that a trade association or "conservation lobby", if it were needed, would evolve on the basis of initiatives from within the industries involved. There was considerable resistance to the idea that Energy, Mines and Resources Canada might serve as a catalyst for such an organization. Furthermore, some skepticism surfaced about the ability of such an organization to agree on policy objectives in view of the diverse and sometimes opposing interests its members would inevitably have (a concern amplified by the Electrical and Electronic Manufacturers Association of Canada.)

3. RESULTS OF THE POST-SEMINAR SURVEY

An evaluation questionnaire, attached as Appendix E, was sent to all participants in the conference. This survey was intended to determine the value of "Retrospect and Prospect" to its participants and to determine what sorts of future events--if any--would be useful. As of April 1982, 28 response had been received.

Participant reactions to the conference, as elicited by Question 1 (see questionnaire), broke down as follows:

Very Worthwhile	2
Worthwhile	15
Somewhat worthwhile	9
Not very worthwhile	1
Not at all worthwhile	0
Did not state	1

On the issue of EMR sponsorship of future conferences (question 3), responses were as follows:

Yes	24
No	2
Did not state	2

The more detailed questions provided a number of specific observations about the conference, and suggestions for planning future events.

There was a strong feeling among respondents that future conferences on conservation should be "more focussed" on a specific topic. Most respondents were either satisfied with the size of "Retrospect and Prospect" or expressed a preference for smaller seminars; little interest was expressed in a larger conference, (although one reply mentioned a larger conference, with smaller "sub-conferences".) These comments did not necessarily imply criticism of "Retrospect and Prospect". Though some respondents offered constructive criticism of the seminar, others noted specifically that their comments applied only to future follow-up meetings. Suggested ways of making meeting topics more manageable included limiting them to a specific sector (e.g., buildings, transportation), to a sectoral issue (e.g., portable liquid fuels), to a set of actors within a sector (e.g., the building industry); or to specific practical actions (e.g., how to market conservation).

Another frequent comment involved the need for "more discussion" and/or tighter, more focussed presentations.

As well, several participants noted a need for more time for informal interactions among those attending the conference.

On the issue of conference participation, a number of respondents emphasized the need for more private sector participation. Two respondents noted that attendance of "true decision-makers" was necessary if future meetings were to have any real relevance.

A few particularly concise observations and suggestions for future events are reproduced below.

> "The conference was held 5 years too late. Example: The CHIP program was designed to conserve energy, however improper planning because of time (insufficient) has caused the CHIP program to be very ineffective." (Response to q. 7)

> "To be utopian, I would like to see EMR working toward supporting a program to train 'house doctors' for residential retroftting." (Response to q. 6)

> "Provide structure but eliminate speakers in afternoon session, e.g., pose a couple of questions and make them the focus... with leaders in role more of animateur than speaker." (Response to q. 2)

> "... combine a general information program as a 'poster session' without speakers and keep your plenaries for a few highlights or some special topics." (Response to q. 7)

> "Suggest early effort be made at session to force mix of participants in a work or contribution environment." (Response to q. 7)

> "More 'rah, rah, let's make money by doing X'; More 'here's how we did it'; More concrete, but small meetings on what government is up to; More stategy sessions; Time for delegates to meet one another." (Response to q. 5)

> "Education of top EMR brass in conservation!" (Response to q. 6)

> "When are we going to get agreed methodology on comparing energy alternatives, conservation strategy, etc.? (Response to q. 7)

> "Any conference put on by a reputable organization like EMR should address a specific need, have the best Canadians on the subject as speakers and direct it toward those who can use the information". (Response to q. 5)

APPENDIX A

SEMINAR AGENDA

SEMINAR AGENDA

Energy Conservation - Retrospect and Prospect

December 2, 1981

Skyline Hotel - Ottawa

8:00 - 9:00 AM	Registration, Coffee	Top of the Hill - Penthouse Floor
9:00 - 9:30	Introduction, Opening Remarks	A.R. Hollbach Assistant Deputy Minister Conservation and Non-Petroleum Energy Energy, Mines & Resources Canada
9:30 - 10:15	Keynote Address	Roger Sant Director The Energy Productivity Center Mellon Institute Arlington, Virginia
10:15 - 10:30	Coffee	
10:30 - 12:30	Energy Conservation in Canada - Potential and Status	
	Potential for energy conservation	Graham Armstrong Senior Advisor, Energy Conservation Conservation & Renewable Energy Branch Energy, Mines & Resources Canada
	Status of current programs	
	Buildings -	Fred Heal Director Office of Energy Conservation Government of Saskatchewan
	Industry -	Carl Wolf Director, Energy Affairs Union Carbide; and Chairman, Industrial Energy Conservation Task Force Co-ordinating Committee
	Transportation -	Peter Reilly-Roe Assistant Director Transportation Energy Division Conservation & Renewable Energy Branch Energy, Mines & Resources Canada
	Where we should be going	David Brooks President Friends of the Earth; formerly Director Office of Energy Conservation Energy, Mines & Resources Canada

.../2/

12:30 - 1:45 Lunch - served in seminar room

1:45 - 3:15 Achieving the Potential - Parallel Workshops

Workshop 1	Workshop 2
Marketing and Financing	**Economic and Business Opportunities**
Chairman - Paul Ray Chief, Conservation and Renewable Energy Division Special Studies Branch Energy Policy Analysis Sector Energy Mines & Resources Canada	Chairman - Graham Armstrong Senior Advisor Energy Conservation Conservation & Renewable Energy Branch Energy, Mines & Resources Canada
Panel - Brian Kelly Middleton Associates; formerly Director Information, Conservation & Renewable Energy Branch, EMR	Panel - Richard Willingham Editor Energy Management in Canada
- Grey Hamilton Vice-President & Secretary Canertech Inc.	- Bill Bartlett Manager Energy Products Centre Residential Division Honeywell Ltd.
- J-P Cristel Director of Client Services Hydro Québec	- Frank Henkelman President Fiberglas Canada Inc.
Open Discussion	Open Discussion

3:15 - 3:30 Coffee

3:30 - 4:00 Closing Plenary - "Where do we go from here?"

Report from Workshop 1

Report from Workshop 2

4:00 - 5:00 Open Discussion

- need for institutional change
- new private sector initiatives
- the role of public policy
- research and information needs

5:00 - 7:00 Reception, Informal Discussion

APPENDIX B

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LIST OF PARTICIPANTS

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APPENDIX C

BACKGROUND PAPER

BACKGROUND PAPER:

"ENERGY CONSERVATION: RETROSPECT AND PROSPECT"

Prepared by Middleton Associates for a Seminar
Sponsored by the Conservation and Renewable Energy Branch
Energy, Mines and Resources Canada

Ottawa, Ontario
December 2, 1981

PURPOSE OF THE DISCUSSION PAPER

With energy users in all sectors more conscious than ever of the rising cost of energy, the subject of conservation takes on a new importance. This discussion paper is an attempt to summarize some of the background of today's energy situation; to highlight lessons learned about energy conservation in the 1970s; and to ask some basic questions about the direction of energy conservation policy and programs in the 1980s.

In none of these areas is the paper exhaustive. It is an attempt to select the most important lessons, and to raise questions for discussion- not necessarily to answer them. It is hoped that the seminar on "Energy Conservation: Retrospect and Prospect" will elaborate on the lessons and suggest at least the most likely or promising answers.

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BACKGROUND PAPER:
"ENERGY CONSERVATION: RETROSPECT AND PROSPECT"

1. BACKGROUND

One of the classic statements of the conventional pre-1973 widsom about energy comes from a 1972 study in which the Chase Manhattan Bank concluded:

> "An analysis of the uses of energy reveals little scope for major reductions without harm to the nation's economy and its standard of living."(1)

This was a viewpoint shared by many, in many countries; the two volumes of An Energy Policy for Canada, which came out just a few months before the OPEC embargo of late 1973-74, contain in their 600-plus pages hardly a mention of improving the efficiency of energy use.

We have all grown weary of clichés about how the facts of energy life have changed since 1973, so a few specifics will suffice. By 1976 the Department of Energy, Mines and Resources was on record as asserting that:

> "Energy conservation provides the most immediate method of relieving our energy problems and constitutes the lowest-cost, lowest-risk policy by which energy self-reliance can be enhanced."(2)

We can see how fast viewpoints on conservation have changed by comparing the 1972 Chase Manhattan pronouncement with one of the conclusions of the 1979 Report of the Energy Project at the Harvard Business School:

> "If the United States were to make a serious commitment to conservation, it might well consume 30 to 40 percent less energy than it now does, and still enjoy the same or an even higher standard of living."(3)

Between 1960 and 1973, Canada's primary energy demand grew at an average of 5.6 percent a year. Between 1973 and 1980, the rate of demand growth dropped to 2.6 percent a year. And in 1973, Energy, Mines and Resources Canada forecast that Canadians would be using 19.4 quadrillion Btu of energy in 1990. By 1980, the forecast had fallen to 11.3 quadrillion Btu--a drop of 42 percent.

Some of this decline in energy growth is the result of lower rates of population and economic growth, or of lower expectations about these values in the future. But much is the result of energy conservation.

1.1 What is Conservation?

A number of images of conservation exist; one which is unfortunately still fairly widespread links conservation with hardship, enforced austerity, a return to the privation of the Depression years, stalled transportation, idle factories and freezing in the dark. That kind of energy future is possible, but it is more likely to be forced on us as a result of failures to conserve energy than it is to emerge as the result of any measures envisioned by responsible advocates of energy conservation.

A more useful, humane and sensible definition of energy conservation can be developed based on the concept of energy services. Consumers demand, not energy itself, but combinations of goods and services such as warm building interiors, lighting in the dark, various kinds of mechanical work, etc. These services can be provided solely by the use of conventional energy forms and current technology, or by substituting a variety of conservation technologies and/or alternate energy forms for large portions of

the conventional energy - while still providing the same quantity and quality of service. Table 1 shows, in general terms, the kind of energy services Canadians demand in 1981.

Two examples illustrate this point:

- We demand an indoor temperature of 20°C and adequate ventilation. This can be achieved (a) by using 175 Gigajoules* a year in an inefficient heating system, in a poorly insulated and weatherstripped house; or (b) by substituting insulation, vapor barriers, more efficient heating systems and air-to-air heat exchangers--and only about 20 percent as much fuel or electricity.

- A recent Solar Energy Research Institute report gives the example of the specific energy service of drying paint on new cars, now provided by gas-fired ovens. Alternative means of providing that service could involve using techniques of heat recovery and to reduce energy requirements, and using some of the fuel value of the emitted hydrocarbons as well; conversion to an alternative fuel; process changes like using higher-consistency paint with reduced drying time; or a fundamentally new process like ultraviolet curing resins with sharply lower energy requirements.(4)

In both cases, the final service provided remains the same. These two examples point the way to defining conservation in terms of energy productivity -- using each available unit of energy to provide far more in the way of energy services than we now do.

There is a category of conservation measures which does not fit neatly into either of the categories so far mentioned; these are often

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*Approximately 1000 gallons fuel oil, 170 mcf natural gas

TABLE 1

ESTIMATED ENERGY SERVICES DEMAND IN CANADA, 1981

Heat (space, hot water, etc.)	<100°C	30%
Heat (including steam)	>100°C	20%
TOTAL heating		50%
Transportation		25%
Electric drive		12%
Other - lighting, specialized electric processes, cooling		13%
TOTAL demand for energy services*		100%

*Excluding non-energy (feedstocks, etc.) uses of energy

Source: Energy, Mines and Resources Canada, 1981

referred to as "lifestyle changes" on the part of consumers, and apply mainly to the household sector. Just how traumatic these changes may be (examples include turning down thermostats, switching to smaller automobiles, or modal shifts to mass transit for commuting) depends on to whom one is talking. But this debate, and the grey area between lifestyle changes and "technical fixes" like smaller cars (are smaller cars a lifestyle change?) should not distract attention from the basic framework of energy productivity.

The fundamental reason for being concerned with energy productivity is an economic one. Over the decade or more before 1973, Canadian energy prices remained steady or fell in real (inflation-adjusted) terms. Since 1973, Canadian oil and gas pricing has been subject to erratic and largely unpredictable increases. The recently-concluded oil and gas pricing agreements provide assurances of substantial, and predictable, increases in oil and gas prices over the next few years. Table 2 provides a history and projection of energy prices in Canada, using the residential sector as an example.

The improvements in energy efficiency which have taken place since 1973 can be seen as a "first generation" of energy conservation measures: many required little or no capital investment, and only readily-available knowledge of how to go about improving energy efficiency. We have learned a lot since 1973, both about the technical potential for saving energy and about conservation's economic effects and institutional problems. In the changed energy price environment of the 1980's, it is important to examine the possibilities for a "second generation" of energy conservation measures and programs.

TABLE 2

ENERGY PRICES IN CANADA - SELECTED YEARS

Residential Sector - Canadian Weighted Average

(1950 dollars)

	Heating Oil (per gallon)	Natural Gas (per 1000 cu. ft.)	Electricity (5000 kWh per yr)	Motor Gasoline (per gallon)
1950	$ 0.18	$ 0.93	$ 57	$ 0.41
1960	0.15	0.78	47	0.32
1970	0.12	0.62	31	0.29
1973	0.13	0.55	32	0.29
1976	0.17	0.71	34	0.32
1977	0.18	0.78	37	0.33
1978	0.19	0.82	39	0.32
1979	0.20	0.82	39	0.31
1980	0.21	0.88	40	0.32
1981	0.25	0.94	42	0.38
1986*	0.35	1.30	50	0.50

*Estimates: Oil and gas on the basis of the Canada-Alberta pricing agreement, electricity on the basis of electrical utility forecasts.

Source: Energy, Mines and Resources Canada, 1981.

2. LESSONS OF THE SEVENTIES

2.1 Energy Conservation is a Supply Option

Conservation, like oil, gas or coal, is an ingredient in the "supply mix," a way of meeting demand for energy services. A diagram in Roger Sant's A Least-Cost Energy Strategy (p. 29) illustrates this point well, showing that because of technological improvements in energy efficiency over the years 1973 through 1978, the bulk of the increase in demand for energy services in those years was met by conservation. The report goes on to note that had the United States' energy uses been allocated among all competing energy supply options in such a way as to minimize consumer cost at 1978 prices, efficiency improvements post-1973 would by 1978 have been the largest single contributor to meeting the demand for energy services.

A simple example from the Canadian context is that, if no insulation had been installed in Canadian buildings and plants over the past five years, in 1982 Canada would need 60-80 million barrels of oil equivalent more than it will need to maintain the same levels of energy services. This is a straight swap - insulation for energy.

2.2 Conservation is Different

If its significance as a supply option is hard to over-estimate, it is also true that conservation (or "conservation energy") differs from the conventional energy supply systems we are used to in a number of important respects.

First, the notion of conservation as energy productivity has an appealing conceptual simplicity, but it also lacks concreteness:

> "One can pick up a piece of coal, hold it in one's hand, and say, 'This is coal.' Conservation is far harder to grasp and comprehend." (5)

Second, conservation means that thousands of individual energy users are producing their own energy at the point of end-use. There is not a single conservation industry comparable to the oil industry or the gas or electric utilities, or even a single coherent and inter-related set of industries providing conservation-related goods and services comparable to, say, the nuclear reactor industry. Rather, conservation involves the use and modification of the products of a range of existing industries, and a few specialized new ones (like consultants in energy auditing).

Third, in almost all cases conservation does not involve simply an off-the-shelf purchase of products or services. Not only can you not buy conservation energy, you cannot often buy a product which will "generate" conservation energy. You can buy a product which will do so in the sense that it will use much less energy than an alternative product to provide comparable services or amenities, like more energy-efficient household appliances.

Conservation energy relies heavily on the element of design. In some cases, like proper siting of new buildings to reduce lighting and heating loads, reducing office lighting to more comfortable levels, or closing warehouse doors between shipments to keep the heat in, no new equipment at all is involved. In other cases, like energy-efficient appliances or new buildings, intelligent re-design is the crucial factor in performance improvements.

All these factors make conservation a challenge for planners familiar only with the centralized production of energy for local distribution as a commodity. Sometimes arguments that conservation is "unpredictable" because of its decentralized nature serve as rationalizations for those unable to come to grips with the challenge. A perceptive article in a recent issue of Alternatives magazine noted that major projects like tar sands plants and pipelines are "agonizing, drawn out and controversial" processes for government. But implementation is easy (for government) once the decisions are finally made.

> "Conservation and renewable energy, on the other hand, are easy to decide upon. They are economic in themselves, cause little controversy and are welcomed by all. They are motherhood. It's in their implementation that they are messy--simply because they are small-scale, decentralized and involved people not just machines."(6)

The transition to trying to inform and influence the decisions of individual energy users (the "demand side") rather than just the decisions of a few large energy producers (the "supply side") can be quite a painful process.

2.3 Conservation's Potential is Greater Than Imagined

In 1977, the Office of Energy Conservation said that modes and conservation measures could reduce Canada's growth in primary energy demand to 2.1% a year between 1976 and 1990. Many people were skeptical, even within the federal government. But in 1980, even without the implementation of some of those measures, the National Energy Program foresaw energy growth over the next decade of only 1.9% a year. These figures are not directly comparable, because of differing projections of economic and population growth, but they do show that we have found the potential for conservation to be far greater than was once imagined.

Calgary's Gulf Canada Square and numerous super-efficient houses now operating or under construction in Saskatchewan and elsewhere show that it is possible, at a very low cost premium, to cut energy consumption in new construction to 15%-30% of that typical of 1973 construction. In existing buildings, the energy consumption of typical 1973 construction can often be cut in half cost-effectively at current prices with proper retrofitting; the "ultimate retrofit" could cut energy use in existing houses by up to 80 percent.

Even more than commercial buildings, the industrial sector is characterized by a diversity of end-uses, making general statements about conservation potential difficult. One general estimate made by Union Carbide Canada Ltd. is that:

> ". . . by the year 2000, average industrial energy consumption per unit of production could drop to less than 50% of the levels required in 1972"

and that:

> "As a result of energy efficiency R & D, some major energy intensive industrial processes could, by 2000, be operating at levels as low as 25% of their 1972 Btu/unit of production standards."(7)

Estimates for materials industries indicate a tremendous process energy-saving potential - over 90% in some cases - simply through the use of recycled rather than virgin materials.(8)

In transportation, the manufacture of gasoline-powered automobiles which achieve three times the average fuel economy of the 1975 vehicle fleet is happening today. The overall fuel economy of the new vehicle fleet has increased by 45% between 1975 and 1981. As the new fuel-efficient vehicles work their way through the market, average fuel economy of the total fleet will obviously improve. It is not unreasonable to expect some further improvements in new-vehicle fleet fuel mileage, as well as in the management of traffic flow patterns. Since automobiles and light trucks account for approximately two-thirds of total transportation energy use, improvements in their efficiency are the largest target for conservation. Improvements in the efficiency of other modes -- for instance, more fuel-efficient aircraft -- are not only feasible but in many cases already under way.

Some further details on energy conservation potential in the short- to medium-term are contained in Graham Armstrong's paper on "Conservation Energy: Potential and Practice in Canada" in the Seminar Kit. Studies in almost every industrial society have shown that it is possible to reduce energy consumed per unit of GNP by at least 50%. Some longer-term projections indicate that industrial societies could generate 3 to 6 times the GNP per unit of energy that they produce today.(9)

2.4 "Price is Not Enough"

Pricing has long been seen as a major barrier to energy conservation; consumers were being fed price signals which fell far short of reflecting even the real dollar cost of energy (requiring the public subsidy of imported oil), much less the long-run replacement cost as reflected in the cost of imports or that of oil sands or frontier oil and gas.

Recent oil and gas pricing agreements in Canada will have the effect of removing a major impediment to conservation. Although conservation has long looked economically attractive compared to the cost of new supply, it has not always done so when compared to the price consumers were paying. (Issues raised by electrical utility pricing and utility rate structures are taken up in a later section of the paper.)

But as economist Donald Dewees recently noted:

> "Demonstrations that higher prices yield lower energy consumption do not prove that other policies are unnecessary, only that there is some role to be played by prices themselves."(10)

Ideally, "life-cycle costing" would be applied to conservation investments: energy users would decide on an appropriate level of conservation by calculating energy costs over the life of the investment, weigh the energy savings from conservation (in both cases using an appropriate discount rate) against the additional costs of conservation, and invest up to the limit of cost-effectiveness.

In practice, this very rarely happens; many conservation investments are not made even when they would pay for themselves in a few years. The result is that as a society, we in Canada (like most other industrial

societies) are far from the situation of a "least-cost energy mix", that is, a situation where we would be combining all energy resources (including conservation!) to minimize the cost of energy services. Many conservation measures might eventually be undertaken simply on the basis of price. But price alone may only induce changes very slowly - for instance, in the energy-efficiency of new buildings - because of numerous other factors. And in the meantime, we may actually move farther away from the most economic mix of energy services.

Table 3 lists some of the reasons conservation investments are not made, even when they appear to be very attractive. This is more of a generic list than a set of specifics applicable to particular sectors. For instance, for the homeowner, problems of capital availability may simply mean not enough cash in the bank to pay for reinsulation, or enough cash coming in to meet the payments on a loan for retrofit. For a multi-national corporation like Union Carbide, in the words of its Chairman:

> "We do not have unlimited budgets to run our business. . . . The problem for companies in a highly competitive industry like ours is that our increased energy costs are not easily passed along to our customers. We are faced with the very difficult choice of advancing the projects we must have to sustain our business, or allocating the money to conservation projects. And, quite frankly, we are sometimes compelled to defer the conservation." (11)

TABLE 3

BARRIERS TO CONSERVATION

Lack of information:

On energy consumption, product life cycle, etc; information may be unavailable, untrustworthy, or available but inaccessible to those who need it.

Splits of costs and benefits:

For instance, between landlords and tenants.

Ability to pass through energy costs:

To tenants; to customers; to the public (through tax-deductibility of energy costs) or some combination.

Other market imperfections:

Such as the fact that in a period of recession, home buyers may overemphasize initial costs at the expense of high energy bills, and individual builders emphasize lowest first cost in a competitive market. Similarly, there may be no incentive for any individual manufacturer to offer more efficient cars or appliances because of consumer lack of information; uncertain market response, etc.

Lack of examples:

There may be no first-hand experience with the fact that conservation technologies can work.

Capital availability:

Whether involving savings, cash flow, or credit, limits to capital availability represent a major barrier to conservation investments, since most such investments require initial payment of the entire cost of the investment, with payback of energy savings coming in gradually thereafter.

Lack of convenience:

The absence of one-stop shopping for efficiency improvements, whether for housing, business, industry.

Lack of technical support:

Shortages of the skills important to conservation investments (building retrofit; energy auditing; etc.) and need for retraining to emphasize conservation. (e.g. of architects, construction workers.)

Table 3 (Cont'd)

Lack of consumer protection:

Or guarantee of system performance, supplier reliability and installer competence.

Tax problems:

Retrofits which upgrade a plant, or increase the value of a home or rental building, may add to property taxes -- reducing the economic incentive to conserve energy.

Note: This is only an incomplete, generic set of barriers to conservation. Some overlap, and many reinforce each other.

2.5 Implementing Conservation is Difficult

Removing the impediments to conservation is a far more complex process than it looks, involving--if it is to be successful--simultaneous consideration of a number of impediments and of the way they interact. For instance, the Canadian Home Insulation Program--an important and innovative approach to the problem of capital availability--has probably been reduced to a fraction of its potential effectiveness by lack of technical support and lack of consumer information. Conversely, demonstration projects provide useful examples and may generate some learning in applications of conservation technologies, but do nothing to address problems of capital availability, splits of costs and benefits, etc.

Conservation programs, to be successful, must take into account the complex and highly entrenched nature of those barriers to conservation. Their nature is such that many can only be removed through government action. Governments must also develop the capability of monitoring the effectiveness of conservation programs, and of changing or supplementing these programs quickly to increase their effectiveness.

2.6 Conservation Delivers Large and Varied Economic Benefits

Much of Canada "exports" large amounts of capital to finance its energy purchases. This creates a drain on provincial and regional economies, and a strain on interprovincial relations, which will grow rapidly more significant as energy prices rise. This is one of the prime reasons for making conservation a new national priority.

An American study found that Franklin County, a semi-rural area of Massachusetts, spent an amount on household energy in 1975 equal to the combined payrolls of the County's ten largest employers. More importantly still, the study found that just paying for the increase in the County's energy costs as prices rose, even if total energy demand grew at only 1.4 percent a year, would require attracting a new plant with 175 employees every year to make up for the increased financial drain on the County's economy. (12)

This is a small scale example. On a larger scale, in 1981 the province of Ontario will spend approximately $6.8 billion on oil and gas. Very little of that money will stay within the province--creating a substantial drain on the province's economy.

Another desirable aspect of conservation, apart from reducing these economic drains at the local and regional level, is that because of the large on-site labor component of many conservation investments like building retrofits, conservation will tend to concentrate more employment near the point of energy use than will new supply; this has obvious benefits for poor regions of the country which find themselves being made poorer by increases in energy costs.

There are more general arguments for conservation, involving the entire economy. As energy prices rise, an expanding component of the income of households and businesses will be used to finance energy purchases. Correspondingly, as the replacement costs of energy climb (the currently-quoted price tag of $15 billion for the Cold Lake plant is just one example), Canada will have to invest an increasing percentage of GNP in energy production. The effect may be to squeeze other sectors for capital, and may very well involve further limits to the capital available at a given interest level to households and small business for conservation investments. The more we pursue a supply-side energy strategy, ironically, the worse the squeeze on capital availability for conservation could become -- thus making it more difficult for energy users in all sectors to shield themselves from the direct impacts of costlier energy.

The alternative "scenario" is this: as an aggressive commitment to conservation enables energy users to spend relatively less on energy, consumers' ability to spend money on other goods and services, and business's ability to invest in new ventures, will increase. A recent review of the job-creation impacts of an energy policy for the United States heavily reliant on conservation and renewable energy found that such an energy strategy would have a significant net job-creation advantage over conventional energy supply. The largest part of that advantage was due simply to "respending effects" -- what happens when consumers have more money to spend on things other than energy.(13)

A final set of economic effects involves the faster energy and financial return on capital invested in energy conservation. Conservation investments tend as a rule to provide some energy and dollar returns almost immediately. On the other hand, "megaprojects" like oil sands plants or electric generating stations may tie up capital for years with no return on investment--the effect being to postpone reinvestment and create another net drain on the economy. In the time it takes to build an oil sands plant, many conservation investments will have paid for themselves completely.

2.7 Energy Conservation Protects the Poor

A recent study found that the impact of rising energy prices in Canada would fall most heavily on low-income households which already spend proportionately high amounts of their income on direct energy.(14) Considering indirect energy purchases (energy embodied in goods and services) may make the impact look a little less regressive. On the other hand, a given increase in the percentage of disposable income spent on energy will have a far more severe absolute effect on a low-income household than on a middle- or high-income one.

Low income people are also those in society least able to respond to energy price changes except on the basis of fairly traumatic lifestyle changes: freezing in the dark. They have no available capital or credit and have limited access to information. Many low-income people are aged, living on fixed incomes which are already being steadily eroded by inflation. Removing barriers to conservation becomes particularly important for the future of low-income people.

2.8 Energy Conservation is Good Business

According to recent estimates by the Department of Energy, Mines and Resources, the market for energy conservation-related goods and services in Canada amounted to more than $1 billion in 1980. In the United States, according to Business Week, the market in 1980 was almost $9 billion--more than doubled from 1979 and more than the amount invested in conservation in the years 1975 through 1979 combined. (15)

It may be useful to classify the industries involved into six broad categories:

1. Thermal upgrading products--mainly insulation, but also weatherstripping, windows and glazing materials, sealants, etc.
2. Heat recovery devices--heat exchangers, heat pumps (which are heat recovery devices of a sort).
3. Control systems.
4. Cogeneration equipment.
5. More energy-efficient end use devices (a modification of present products which cuts across many manufacturing sectors) like automobiles, appliances, or electric motors.
6. Energy conservation-related services like design, conculting, engineering, policy analysis, etc.

As the list suggests, the industries actually involved are highly diverse; and there are relatively few new industries involved. Even some major innovations, like new generation control systems, residential air-to-air heat exchangers, and super-efficient building design, represent not new industries, but rather new or modified products of existing industries.

In some of these areas, like super-efficient building design, Canadian technological and industrial capability is very highly developed. In others, the markets involved are filled principally by imports. In the latter case, a particular concern is that the products involved may not be designed specifically for Canadian conditions. This results in significant energy and economic penalties.

3. ISSUES FOR THE EIGHTIES

3.1 Marketing Conservation

The nature of energy conservation is such that it involves hundreds, thousands, or (in the case of households), millions of energy users, who can also be seen as "generators" of conservation energy.

This dramatic difference from traditional modes of supply suggests that it may be useful to look at energy conservation at least in part as a problem in market penetration. There is a market for conservation, among large and often diverse groups of users, and the issue is to make the spread of a new set of technologies among those users much more rapid than it now is.

For actors in both government and industry, the problem therefore becomes one of:

- assessing the potential of a market;
- figuring out what the barriers are which inhibit or prevent the spread of conservation technology through that market; and
- designing mechanisms or strategies which will remove those barriers.

This perspective emphasizes the way in which conservation is different from conventional supply, and emphasizes as well the diversity of the factors which encourage (or discourage) consumers and businesses to adopt energy conserving technologies.

One lesson from marketing is that the barriers to adoption of a technology may differ at different stages of its penetration of a market. A frequently-used model of market penetration places the adopters of a new product or technology into five categories: "innovators," "early adopters," "early majority," "late majority," and the "laggards".

Although innovators may be the pioneers in new product areas, it is the "early and late majority" who account for the bulk of technological diffusion. Figure 1 shows the role of each category of adopter in contributing to total market penetration of a technology.

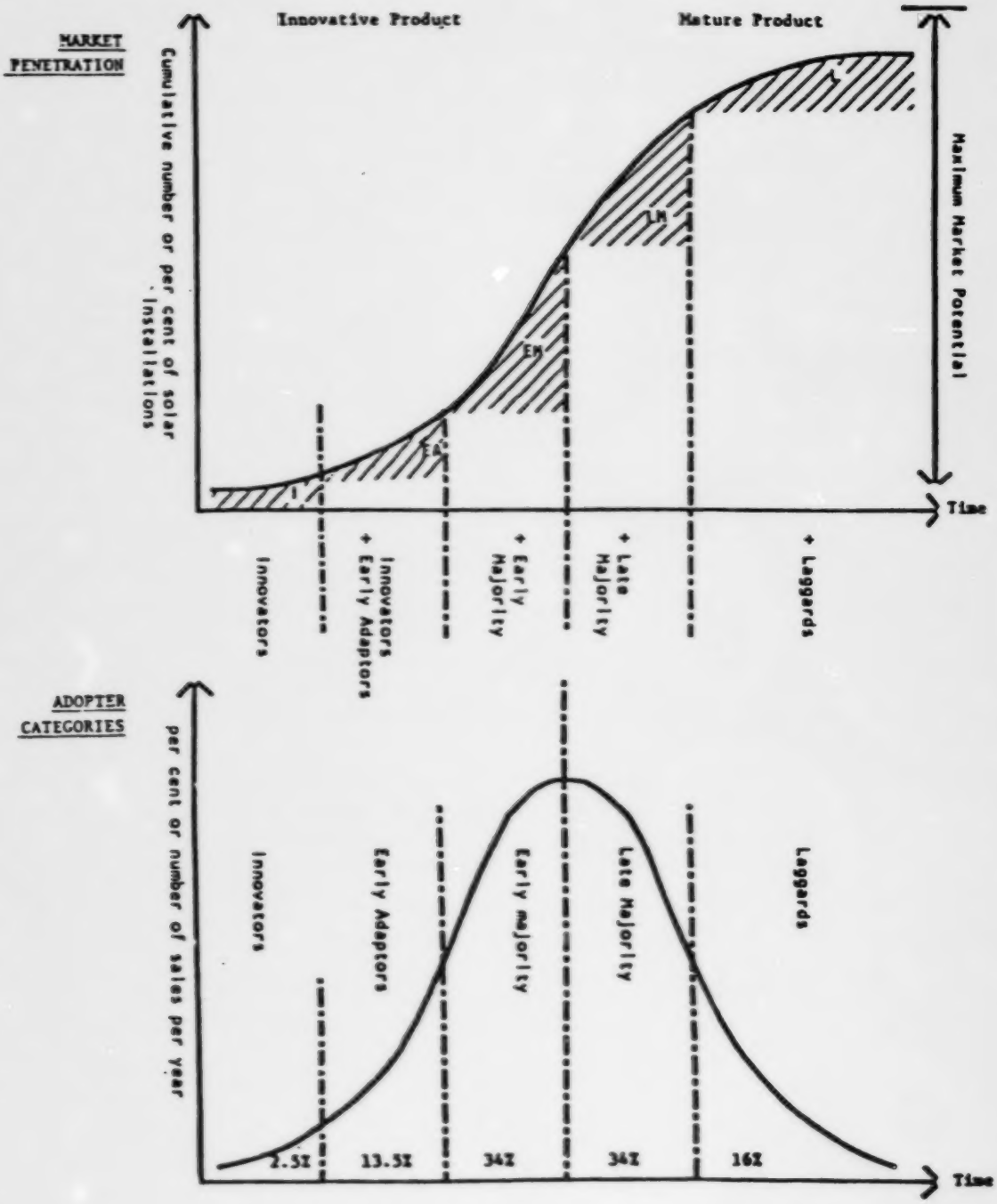
This classification can usefully be applied to homeowner energy conservation retrofits or to solar heating. For affluent innovators, capital availability may not be a problem, and they may be attracted by the very newness of the technology. Conversely, much of the consumer population will shy away from new-ness; will want evidence (of various kinds) of performance, perhaps guarantees; and may well be hindered by lack of capital. This changing nature of conservation markets suggests that in many cases the experience of the recent past provides a very poor guide to the future, since the factors affecting the next stage of market penetration--and the barriers impeding it--may be quite different. It also suggests that industries producing for this market have the economic advantage of being able to anticipate long production runs--a factor which should be taken into account by financial institutions in financing such industries.

A lesson to be learned from this example is that it is extremely important to have <u>coherent</u> strategies which assess in detail the barriers to diffusion of energy conservation, and which incorporate programs designed to minimize the significance of the barriers (or to provide positive incentives) in a sequence and combination which has direct relevance to the needs of the market. This is fairly basic to marketing strategy, but it often gets lost in energy planning.

A market development perspective on energy conservation need not restrict policy to removing barriers of a fairly conventional sort. In many cases, the effect of barriers is to prevent a market from developing or to build in imperfections. In such cases, standards or other mechanisms outside the usual ambit of "marketing" may be essential to produce the sort of results (in terms of lowest-cost energy services) that economics tells us a market properly-functioning should produce. In such a market, consumers would move toward the lowest-cost mix of energy services which would fill their requirements, subject to some caveats about convenience and (obviously) availability. The general aim of conservation strategies (and they should be strategies, not just programs) should be to move toward this lowest-cost energy service mix.

FIGURE 1

MARKET PENETRATION AND ADOPTER CATEGORIES



3.2 Issues for Governments

The overall economic benefits of conservation provide the major rationale for giving it a high priority in energy and economic policy. Energy policy should attempt to make possible "symmetrical comparisons", by consumers and investors, between conservation and other ways of meeting the demand for energy services.

Historically, energy policy has been concerned mainly with the "supply side" of the equation--making sure adequate supplies of energy for the future were available. This orientation has resulted in a number of barriers to conservation, and a lack of the type and magnitude of incentives which have been provided for new energy supply. Moving toward symmetrical comparisons will require paying much more attention to the "demand side" to ensure that consumers or investors are basing their decisions about conservation and conventional energy supply forms on comparable cost assumptions, levels of information, economic criteria and levels of subsidy.

3.2.1 Many impediments to conservation involve information or institutional barriers. Removing these impediments will require facing issues like:

- How adequate are existing levels of information about conservation techniques, and about the economic benefits of conservation?
- If they are inadequate, is there a role for more government activity in making information available? This might include both conventional approaches to information and innovative programs like BELS. BELS stands for Building Energy Labelling System, and involves a requirement that buildings be "labelled" with information about their energy consumption level. If they are rental buildings, this information must be passed on to current and prospective tenants.

- Many consumers are uncertain about the actual dollar savings they can expect from conservation because of problems with suppliers and contractors. Can programs to certify or regulate contractors, or inspect their work, remove some of this uncertainty?

- Are there ways governments can improve the level of consumer protection and consumer confidence in conservation technologies other than by direct regulation?

- How can legal barriers to conservation, like the absence of protection for sun rights (for solar installations) and the problems posed by some building code and zoning provisions, be removed?

3.2.2 Problems of financing and capital availability may occupy a major part of governments' efforts in the conservation field. A number of general categories of mechanisms exist to make capital available for energy conservation on a basis more closely comparable to that on which it is available for new supply:

- direct cash grants, along the lines of CHIP;

- cost-sharing grants for major projects of energy efficiency improvement in industry;

- low- or no-interest loans, either made directly or through public utilities, ideally with repayments not exceeding energy savings in any given year;

- tax incentives, ranging from sales tax removal to one-year writeoffs on energy conservation investments;

- purchase and lease-back of conservation equipment by government agencies to business and industry.

Whatever the form financial incentive programs take, they raise a number of important issues for governments:

- the need to interface with programs at other levels of jurisdiction, or at least not to work at cross-purposes;

- the need for ways to monitor and evaluate the effectiveness of programs in terms of investment induced and energy saved;

- the corresponding need not to reject proposed programs simply because they are difficult to evaluate in conventional terms;

- the need to acknowledge that financial incentives address only one set of impediments to conservation. Addressing this set of problems in isolation may simply be a waste of effort and money, and will probably hurt conservation's long-term credibility with consumers, business, and other branches and levels of government.

3.2.3 What should be the role of standards and regulations? Fuel economy standards for new cars have achieved a major reordering of the priorities of the automobile industry in a relatively few years--a reordering now reinforced by market forces, but one which might not have begun until much later in the absence of regulation.

- A 1980 study for the Canadian Electrical Association found that further major improvements in home applicance efficiency were technically feasible. They would yield "social net benefits" to Canada of $3.1 billion, benefits to private consumers of $2.0 billion, and benefits to utilities of $1.9 billion. But the study found that mandated energy efficiency standards would be needed to ensure that the improvements evaluated are made with minimum delay. (16)

- Few provincial building codes embody any energy-efficiency standards. High standards for new residential construction may be the only way of moving toward life-cycle energy costing in houses. The cost premium is small, can be financed as part of mortgage arrangements, and is repaid in energy savings within a fraction of the building's life. Industry-wide standards would minimize the disincentives to any individual builder to improve energy efficiency.

Problems of standards and regulation include:

- The tendency of standards to be viewed as maxima rather than just as minimum levels;

- The relative inflexibility of standards: they tend to emphasize design features (e.g. thickness of insulation) rather than actual performance (e.g. heating energy use), hence discouraging innovative techniques;

- Are adequate enforcement techniques and personnel available? Are the costs of enforcement and administration reasonable in view of the energy and dollar savings achieved?

3.2.4 A problem which exists not only in the area of standards but in other areas as well is that of intergovernmental cooperation. Often energy conservation will be under the jurisdiction of several levels of government: for instance, building codes are under provincial jurisdiction, and zoning requirements are a municipal (or regional) matter. Effective development of conservation programs requires a high level of intergovernmental cooperation and coordination, and a respect by all levels of government for the legitimate jurisdictional concerns of others.

3.2.5 A category of alternatives to energy-efficiency standards is suggested by the example of BETS (Building Energy Tax System). BETS would limit the tax-deductible amount of energy costs in commercial and apartment buildings, based on energy budgets for specific building types. Its advantages include:

- Relatively easy enforcement;
- Applicability to both new and existing construction;
- Relative ease of adjustment over time (to reflect higher energy replacement costs, advances in technology);
- Measurement of actual building energy performance.

The disadvantages of BETS include:

- Potential for setting energy budgets which fail to reflect the diversity of building types;
- The need for accompanying mechanisms (in some cases) to keep building owners from simply passing on costs to tenants or customers.

Are there other sectors in which mechanisms similar to BETS could be applied?

3.3 Issues for the Conservation Industries and Government

3.3.1 One set of issues involves changes in the structure and relationship of the industries involved in energy conservation through manufacturing of products or provision of services. These industries could evolve in a number of ways, including:

- the present pattern of provision of hardware by many, unrelated manufacturing firms (though provision of a certain type of hardware, like fiberglass insulation, may be dominated by a few firms) and wholesale/retail outlets, with installation and other services provided by another (relatively) large set of firms;
- changes in retailing such as "energy stores" which would offer a complete range of energy conservation-related hardware for the household sector;
- the provision of complete energy service packages including hardware choice, purchase, design, installation and maintenance (analogous to the services provided by architectural firms in the case of major new commercial buildings);
- "vertical integration" of the conservation industries, with the above model expanded to include manufacture of at least some hardware;
- a major role for the utilities, not only in financing conservation (where many, especially south of the border, are already active) but in procurement, provision of related technical and design services and inspection;
- the growth of "turn-key" energy services for industry.

All these models would involve somewhat different roles for government, and different requirements for government-industry liaison and co-operation. If the structure of the industries remains little-changed,

government may need to play a major role in providing reliable information as well as technical support and a favorable financial/marketing environment. Conversely, in the case where the industry comes to be dominated by major, vertically-integrated "energy service corporations" or conservation utilities, the governmental role may change to involve consumer protection not against poor service, but against monopoly/oligopoly power, or against utilities' bending of conservation programs in the interests of objectives unrelated to conservation (for instance, tying conservation financing to conversion to "their" energy source; neglecting cost-effective conservation measures in the interests of stabilizing their load structure).

3.3.2 Is it fair to say that government will always need to be involved in providing a favorable financial environment for conservation, since--at least in the recent past--it has provided that service to all the energy supply industries which are now significant? Or will conservation become fully viable in the marketplace without subsidy or intervention given future energy prices?

3.3.3 What will be the role of government agencies like Canertech and Nouveler in the conservation field? What should their role(s) be:

- Providing venture capital;
- Retailing conservation-related products ("energy stores");
- Financing research and development;
- Engaging in manufacturing to fill gaps in the availability of specific products;
- Offering "energy service" packages, including procurement of hardware, installation or design, and even financing?

3.3.4 Should government be providing financial support for an association of conservation industries (The Canadian Association of Conservation Industries)? Are there other ways in which government should be taking action to influence the way in which the conservation-related industries develop?

3.3.5 The market for goods and services associated with conservation is a large and growing one. It is important to design policies to make sure that Canadians enjoy as many benefits as possible from the expansion of this market, in terms of employment, investment opportunities, and technological capability.

Governments may need to address questions of industrial policy like:

- Is more support needed for the development of the industries involved in energy conservation, whether in the form of research and development funds; venture capital; or tax incentives?

- How much of the market in goods related to conservation is met by goods manufactured in Canada? How much of it is met by imported goods, or by Canadian assembly of imported subcomponents which involves only low levels of value-added and employment in Canada?

3.4 Issues for the Private Sector

3.4.1 One set of issues which emerges for the private sector involves the existing level of government programs (including pricing) to promote conservation.

- Are the private sector firms in the conservation market satisfied with the existing level of incentives to conserve energy?
- If so, arguments for expanded conservation incentives should be developed only on the basis of factors other than the needs of the industries in question.
- If, on the other hand, the industries involved are not satisfied with existing conservation incentives, what changes would they like to see in the policy environment?

3.4.2 A second, and more extensive, set of issues involves the effectiveness of the private sector in exploiting growing markets for energy conservation-related goods and services. What are the limiting factors on the ability of individual firms or industries to respond to these markets? Possible limits include constraints on capital or manpower availability for expansion, and lack of consumer awareness of the benefits of conservation.

Remembering that many of the firms involved will not be in the business principally of producing for the conservation market, could individual firms still be more aggressive in pursuing the conservation market for their own products? And, in the information field more generally, it is reasonable to expect the firms involved with conservation-related products to be more active and aggressive:

- in providing information not only about their own products but about the benefits of conservation generally?
- in trying to ensure the consistency and reliability of information like product specifications and performance claims?

3.4.3 Another important consideration may be the need for retraining of large segments of the labor force. In buildings sector, architects and engineers may need continuing retraining in the developing techniques of energy efficient building. At the other end of the process, construction workers and supervisors may need to be made aware of the importance of specific construction details for the proper functioning of super-efficient buildings. (For instance, vapor barriers must be kept intact.)

3.4.4 Many of the constraints on exploiting the potential market for energy conservation are not within the limits of individual firms or industries to remedy; they are part of the more general policy environment. Along these lines:

- What could the industries involved in conservation be doing to create a more favorable climate for investment in energy conservation?

- Is there a role for a "conservation lobby," or an organization of the industries involved in the conservation market, which would press for energy policies and programs more favorable to conservation?

3.4.5 Industry in general is, of course, also a major user of energy (the largest single energy-use sector in Canada). In this context, questions for the private sector include:

- How satisfied are industrial energy users with the existing level and structure of incentives to conserve energy?

- At present, industrial energy users tend not to adopt energy-saving technologies unless the payback time on the investment involved is three years or less. (17) How can this situation be changed, in the interests of moving closer to a least-cost energy services mix and of maintaining the long-term competitiveness of the industries involved?

3.5 Issues for Utilities

3.5.1 John Sawhill, President Carter's Deputy Secretary of Energy, observed in 1980 that:

> "Utilities, as businesses, see directly the marginal cost of new energy supplies. By contrast, their customers see only the average cost . . . . As a result, from an economic point of view, utilities can properly justify spending more on conservation than their customers can." (18)

How true has this been for Canadian utilities, and how have they reacted? What are the prospects for the future:

- Many Canadian electrical utilities, in particular, have a mandate to provide service at cost. How far have Canadian utilities diversified in terms of interpreting this mandate to involve the delivery of lowest-cost energy services, through conservation?

- Are utilities, because of their existing infrastructure, contacts with customers, general competence, and financial resources, particularly well-suited to promoting conservation? (For example, by offering long-term financing to customers for improvements in energy efficiency, which could be inspected or even performed by the utility to ensure satisfactory work.)

- Conversely, should utilities be trusted to promote conservation? Will their vested interests in keeping up revenues or promoting conversions which will increase their market share make them ill-suited to promoting conservation fairly?

3.5.2 Utilities have some legitimate concerns about conservation's effect on their structure: for instance, shifts in the shape of load curves and their effect on operations and system costs.

- Are there ways of compensating for the negative impacts of the conservation on utilities, in ways which do not slow the implementation of conservation?
- Should utilities be permitted to refuse to connect service to new low-volume users?

3.5.3 Utility pricing invariably invokes claims that rate structures may impede conservation:

(a) by setting rates too low to reflect the marginal costs of new supply;

(b) by charging large volume users significantly less than smaller users for the same amount of incremental energy consumption;

(c) through declining-block rate structures which lower the cost of energy as consumption by a particular user increases.

Utilities (and large energy users) reply that lower rates for large users reflect lower costs to the utility; that, if anything, small consumers are already being subsidized by larger users; that marginal cost pricing is unworkable because of the difficulty of determining true marginal cost and of setting revenue requirements; and that declining-block rate structures, like customer classes, have a sound accounting basis.

One of the fundamental issues is that accounting costs do not distinguish between historic and replacement energy costs, or between the cost of producing or purchasing energy and the cost of distributing it:

- If we want utility rates to track energy production or replacement costs, how can this problem be avoided?
- If restructuring utility rates to track energy costs proves too intractable, are there other types of policy measures which could achieve the same objectives? E.g., could utilities be encouraged to become total energy service corporations involved in financing conservation? Or could a tax be imposed on utility energy sales, part or all of which would then be redistributed to low-income utility customers?

3.5.4 The prospect of more utility involvement in the conservation field raises the same issue mentioned earlier, in the context of other industries, of the implications for governments' role. If the utilities were to become principal financiers or delivery systems for conservation, governments' role might be limited to that of a watchdog, ensuring that utility priorities unrelated to conservation don't result in "program-bending." On the other hand, if utilities take a relatively minor role in the transition to least-cost, energy-service approaches, governments may have to be more concerned with the financing of conservation, technical support functions, and consumer protection. If utilities become involved in these areas, they can probably be relied upon for competence with minimal detailed supervision.

AFTERWORD

The purpose of this Discussion Paper has been to review the recent experience with energy conservation in Canada and to suggest some of the key issues facing both governments and the private sector in the 1980s. We have not pretended to have all the answers and some readers may even disagree with our statement of the questions. But if constructive discussion follows, the paper - and the seminar - will have served one of their prime purposes.

It is hoped that "Energy Conservation: Retrospect and Prospect" will be only the first of many formal and informal consultations aimed at realizing the full potential of energy conservation in the 1980s. Continued discussions will hopefully lead to the development of joint and co-operative actions for the rapid and successful implementation of a broad range of energy conservation measures.

The opportunities demand such action - the benefits will reward it.

NOTES

1. Quoted in Roger Sant, The Least-Cost Energy Strategy (Arlington, VA, 1980), p. 22. (Copy in Seminar Kit)

2. An Energy Strategy for Canada (Ottawa, 1976), p. 28.

3. Robert Stobaugh and Daniel Yergin, Energy Future (New York, revised edition, 1980), p. 167; see, more generally, all of Chapter 6, "Conservation: The Key Energy Source."

4. Solar Energy Research Institute, A New Prosperity: Building a Sustainable Energy Future, (Andover, MA, 1981), pp 226-227.

5. Stobaugh and Yergin, Energy Future, p. 169.

6. Anon., "Energy, Mines and Resources Revealed," Alternatives 9(3), Fall 1980.

7. Union Carbide Canada Ltd., submission to National Energy Board in the Matter of Supply of and Requirements for All Canadian Forms of Energy (September, 1980), p. 28.

8. C.T. Hill and C.M. Overby, "Improving Energy Productivity through Recovery and Reuse of Wastes," in John C. Sawhill, ed., Energy Conservation and Public Policy (Englewood Cliffs, NJ, 1979).

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10. D.N. Dewees, "Energy Policy and Consumer Energy Consumption" in P. Nemetz, ed., Energy Crisis: Policy Response (Montréal, 1981), p. 137.

11. Quoted in Stobaugh and Yergin, Energy Future, pp 203-204.

12. Future Studies Program, University of Massachusetts, "Franklin County Energy Study: A Renewable Energy Future", Executive Summary (Amherst, MA, mimeo, n. d.).

13. L.S. Rodberg, "Employment Impact of the Solar Transition," study prepared for the Subcommittee on Energy, Joint Economic Committee, U.S. Congress (Washington, D.C., 1979).

14. Social Planning Council of Metro. Toronto and M. Miloff, "The Impact of Energy Costs on Low-Income Households" (Toronto, mimeo, 1980); summarized by M. Miloff in Alternatives 9(3), Fall 1980.

15. Graham Armstrong, "New Business Opportunities in Energy Conservation" (Ottawa, mimeo, 1981); "Energy Conservation: Spawning a Billion-Dollar Business," Business Week, April 6, 1981 (both in Seminar Kit).

16. Ontario Hydro, "Energy Analysis of Major Household Appliances," Draft (Toronto, 1981).

17. Klimoff Engineering Ltd., "Investment in Energy Efficiency," Office of Energy Conservation Research Report #7 (Ottawa, 1977); Graham Armstrong, "Conservation Energy--Potential and Practice in Canada" (Ottawa, mimeo, 1980) (in Seminar Kit).

18. J.C. Sawhill, "Utility Resource and Financial Planning," in S. Westly, ed., Energy Efficiency and the Utilities: New Directions (Sacramento, 1980), pp 118-119.

APPENDIX D

SPEAKERS' PRESENTATIONS

(Text or Speaking Notes)

THE LEAST-COST ENERGY STRATEGY AND CANADA

December 2, 1981

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After nearly a decade of political struggling to fashion government solutions for energy problems, the United States now appears to be ready for a fundamentally new approach. One manifestation of this new readiness is President Reagan's election, which is being interpreted as an indication that many people believe past failures have arisen from the false belief that energy problems are conducive to political solutions.

Two years ago, after examining the confusion resulting from trying various political solutions, we posed and tested a radically different hypothesis. It was postulated that instead of producing, allocating, and using energy according to complex government controls, the United States should treat energy as it does any other commodity whose price and supply are uncertain. Energy, after all, is fundamentally a class of commodities produced, traded, and consumed predominantly in the private sector -- essentially similar to such primary goods as foodstuffs, metals, and forest products which are incorporated into finished goods and used by consumers. The processes by which these goods are produced and used are guided by their relative costs, not by politics. While this hypothesis in no way ignored the political dimensions of the energy situation, it recognized that the energy system was altogether different from, for example, the U.S. national defense establishment or the space program, for which government is charged with the operating responsibility for the technical systems involved.

To be sure, there was obvious danger in this approach. If the various energy forms were dealt with merely as commodities, one would expect both individuals and firms, as they produced and consumed these fuels, to pursue their own self-interest. Therefore, the level and mix of energy production would be adjusted so that only the most competitive energy sources would survive. In that case, what would be the impact on both low income and typical consumers, the environment, and the national security?

To test the consequences of adopting this commodity paradigm for energy, we constructed The Least-Cost Energy Strategy in the fall of 1979 -- a unique calculation of how the energy system would evolve if it were to be guided by economic forces alone (1). For this analysis, we assumed the elimination of any regulation affecting energy choice; and we also assumed technology selection by consumers according to their own economic self-interest. Instead of discovering that the consequences of unbridled competition and the pursuit of self-interest in energy markets would be a recipe for social disaster, we learned that a host of our most common propositions about energy were myths.

The principal departure from more conventional approaches was the decision to consider energy as a means of providing the services -- mobility, comfort, and industrial heat -- associated with healthy economic growth. For example, people do not need or want gas or electricity in their home; they want comfort and convenience. Industry doesn't really care about using natural gas or coal; they need steam or machines that operate to produce products. When we analyzed energy services that way, it became obvious that fuel or electricity was only a part of what was required to provide a useful service. For example, making rooms comfortable may require fuel oil or natural gas, but it also takes a furnace, thermostat, duct work, insulation, and numerous other support items. What is important is putting all the components necessary for delivering a service together in such a way to minimize the cost of the total service.

With this view of services, we calculated the combination of fuels and energy using devices (such as more energy efficient furnaces) that could have met the United States' actual demand for energy services in 1978 at the lowest possible cost. The results -- while clearly not a prediction of what would happen -- served as a guide to what was possible if simple economic self-interest were the principal motivating force behind our choice of energy technologies.

We have now updated that exercise so that instead of assessing only the U.S. conditions in 1978, the least-cost fuel mix and investment pattern has been projected through the year 2000*. The implications of this approach are even more surprising today than they were in 1979 -- and several additional "truths" have been put into question. The most prominent of these is that "Energy is Scarce". Granted, the end of our low cost and conventional gas and oil supplies is on the horizon. But because we feel that energy in the relative quantities we now use is vital to our economic well-being, a fear of 'running out' has motivated much of the U.S. energy strategy.

For example, in 1974, some of us in the United States Federal Energy Administration helped support that view by posting large numbers in our windows to remind the public of how many days supply of oil remained in petroleum reserves; the U.S. Congress passed laws to control energy prices and allocate 'shortages' in an equitable manner (2); a program was established requiring certain utility and industrial operations to switch from scarce oil and gas fuels to coal (3); the Fuel Use Act legislated numerous complex rules restricting natural gas and oil use in industry and utilities so dwindling supplies would be available for use in homes and other 'priority' uses (4).

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*Technically these projections were made using the economic growth and fuel price assumptions of the Mid Price case of the Energy Information Administrations Administrator's Report to the U.S. Congress, 1979. The specific numerical results presented here depend upon these assumptions, but the qualitative conclusions we draw seem valid for a wide range of economic growth and price assumptions. Nevertheless, necessary amounts of capital and fuel were assumed to be available at the prices assumed, with the quantities demanded checked for consistency with available supplies. Details of this methodology are presented in Appendix A.

Major tax credits and other stimulants were created to urge conservation or the switch to renewable technologies which tapped the infinite and inexhaustible energy of the sun (5). Standards were implemented or proposed for the performance of automobiles, buildings, appliances (6). Grants and information designed to facilitate conservation were introduced (7). Finally, the Synthetic Fuels Corporation was created in an attempt to accelerate the development of liquid and gaseous fuels against the day when conventional oil and gas supplies become short (8).

Since fossil fuels are indeed finite and since energy has been an integral part of U.S. industrialization, few of us have seriously questioned the scarcity rationale for those actions. But what we find is that there is not now, nor will there likely be in the forseeable future, a scarcity of ways to provide the U.S. with the energy services it needs. It is a discovery that does not or at least should not surprise many economists. What is apparent is that energy commodities are only a means of supplying the needs that <u>are</u> vital to our economy, namely services such as heating, lighting, cooling, and mobility. Already the U.S. economy is using about 13 percent less energy to produce each dollar of product than in 1973 (9). Light bulbs have been developed that use one-fourth the electricity for the same amount of illumination as the bulbs they replace (10); homes are being built so that natural conditions provide all their heating and cooling; and new automobiles go nearly twice as far on a gallon of gas as the average of all vehicles in use in 1973 (11).

To clarify the magnitude and composition of essential energy use in the U.S. economy, we have projected energy needs for the next 20 years strictly on the basis of what combinations of fuels and end use equipment cost the least for services delivered. This analysis indicates that by the end of this century, each dollar of gross national product should require about 60 percent

of the energy now used. When compared with the official U.S. government forecast for the same economic growth projections shown in Figure 1*, the least-cost path requires 76 percent as much oil, 79 percent less imported oil, 59 percent as much renewable energy and about 50 percent as much coal and nuclear generated electricity. The only least-cost fuel use that would exceed the government demand forecast is natural gas. And only with regard to the use of coal in industry do the two projections find common ground. Since both projections use exactly the same economic and fuel price assumptions, the comparison is remarkable. The least-cost primary energy required per dollar of GNP is 23 percent less than the government forecast (See Figure 2).

Pursuing the least-cost path for energy use in the 1980's, it develops, would involve no growth in actual fuel consumed. Economic growth, projected at 3.2 percent per annum, could occur through greater investment in more efficient end-use equipment and materials -- which would in turn make fuel available in sufficient amounts to satisfy growth in energy service demand. Relative to 1978, as shown in Figure 3, oil use declines during the two decades; oil imports are reduced to manageable levels by 1990 and all but disappear from the energy mix by 2000. Natural

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* The forecast shown is from the 1979 Energy Information Administrator's (EIA) Report to the U.S. Congress, based on comparable economic growth and fuel price assumptions. EIA's recently released 1980 report projects 103.5 quadrillion Btu by 2000. However, most of this reduction seems to be due to a lower economic growth rate (3.2 percent less real GNP in 2000) and the use of higher oil prices ($60/barrel in 1979$ by 2000 versus $44 in 1979). One other study worthy of mention in relation to these results is the not yet released SERI (Solar Energy Research Institute) report, based upon least-cost principles, projecting 62-66 quadrillion Btu by 2000. While we have not conducted a detailed comparison, the lower SERI projections seem to stem from use of marginal cost pricing, additional government regulation and somewhat more optimistic technological assessments.

FIGURE 1
COMPARISON OF LEAST-COST
PRIMARY ENERGY REQUIREMENTS AND EIA FORECAST
(IN QUADRILLION BTU'S)

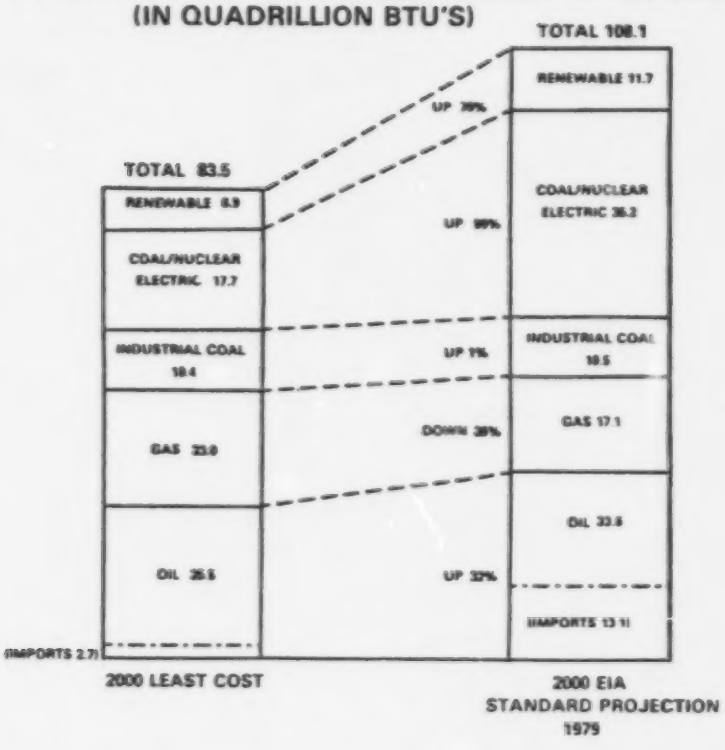


FIGURE 2

PRIMARY ENERGY PER DOLLAR OF GNP

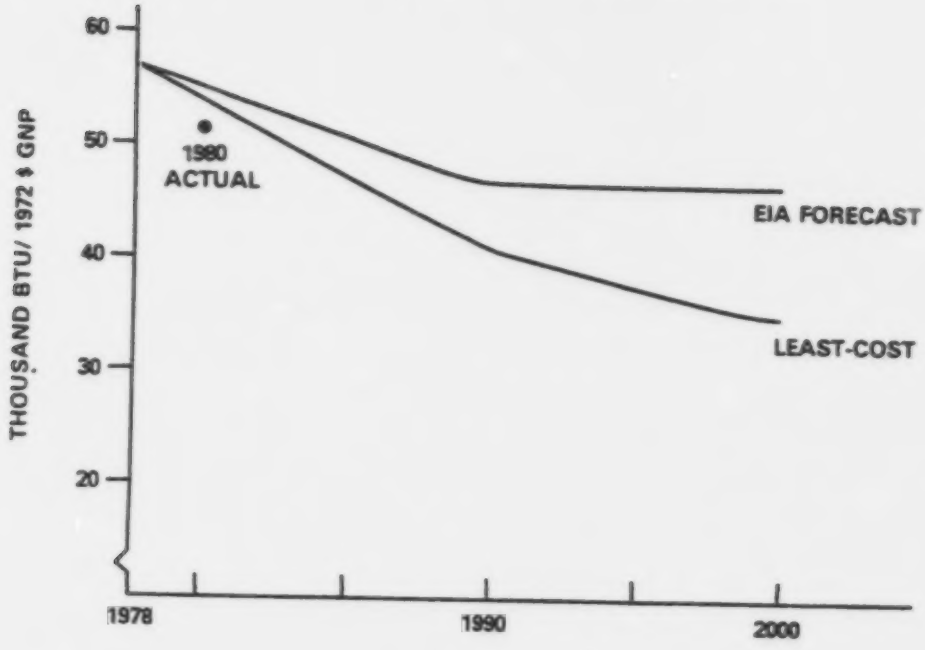
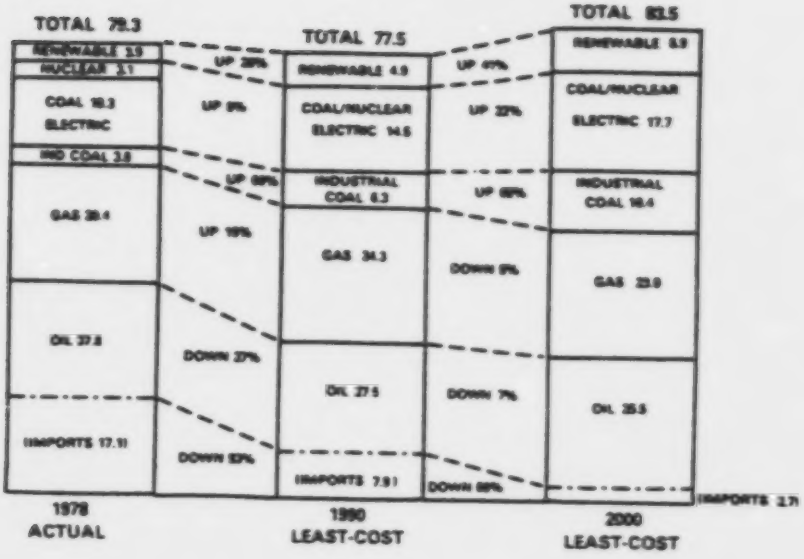


FIGURE 3

PRIMARY ENERGY REQUIREMENTS FOR THE LEAST-COST ENERGY STRATEGY (IN QUADRILLION BTU'S)



gas use increases in the 1980's and then declines in the 1990's in the face of competition from coal and electricity.

As shown in Figure 4 depicting delivered energy (exclusive of central station electric generation losses) demand for electricity produced from central generating stations is almost flat through the 1980's and then increases by 1.0 percent per annum in the 1990's. Within the central station sector, coal and nuclear are assumed to be replacing oil and gas as power sources at the same rate projected by EIA. Total electricity growth (including both centralized and decentralized generation) amounts to 0.7 percent in the 1980's and 1.3 percent in the 1990's.

Transportation

In this least-cost calculation, the total fuel used in transportation declines from an initial value of 20.5 quadrillion Btus in 1978 to 17.9 quadrillion Btus by 2000 (Figure 5). This occurs despite the gradual growth of the economy and after allowing for ever increasing amounts of transportation services consistent with that growth. The fuel mix doesn't differ much from that of today: liquid fuels provide the bulk of the fuel needs for various modes, supplemented by electricity for subways and selected high density rail traffic areas, and natural gas for the operation of pipelines. By far the most striking feature of this pattern of fuel use is the decline in the role of the automobile as a fuel consumer. Fuel consumed by automobiles drops from 11.1 quadrillion Btus to 5.4 quadrillion Btus by 2000 even though the number of cars and miles traveled increases by 22 percent. In contrast to automobiles, the other modes all show small but consistent increases in fuel use. However, the net increases in all of these modes together are not as large as the decrease in automobile fuel use.

FIGURE 4
LEAST-COST DELIVERED
ENERGY REQUIREMENTS
(QUADRILLION BTU)

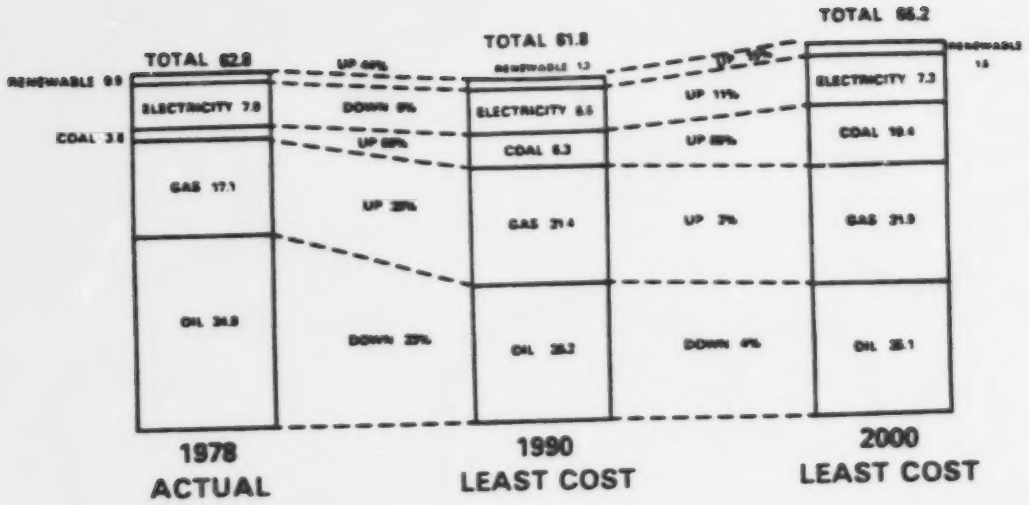
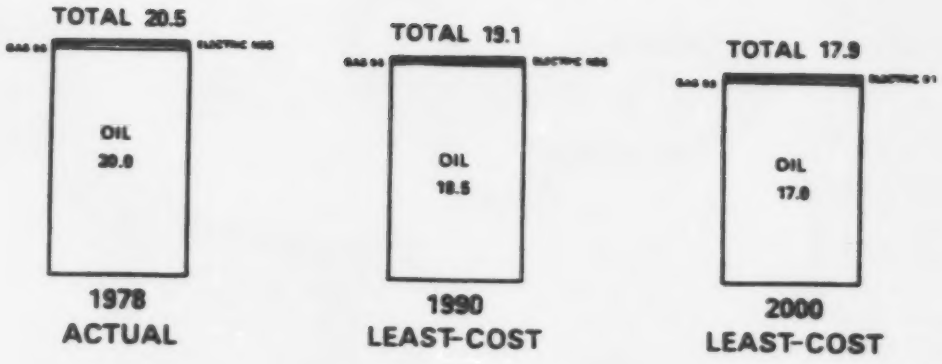


FIGURE 5

LEAST-COST PRIMARY ENERGY REQUIREMENTS
FOR THE TRANSPORTATION SECTOR
(IN QUADRILLION BTU'S)



The overall reduction in fuel use shown in Figure 5 is made possible by combining cost effective automotive technology improvements in three main areas: engine, drivetrain, and chassis. Possible improvements in each of these areas were assessed in terms of their percentage efficiency improvement, cost to the consumer, and date of availability. As each cost-effective measure became available, its introduction into the new car fleet in that year was traced and the impact on the total fuel consumed in each year from the new plus existing fleet was calculated. By the year 2000, the average miles per gallon of new cars reached 51 mpg on an EPA composite basis or 43 mpg actual based upon observed differences between on the road experience and EPA test results (Figure 6).

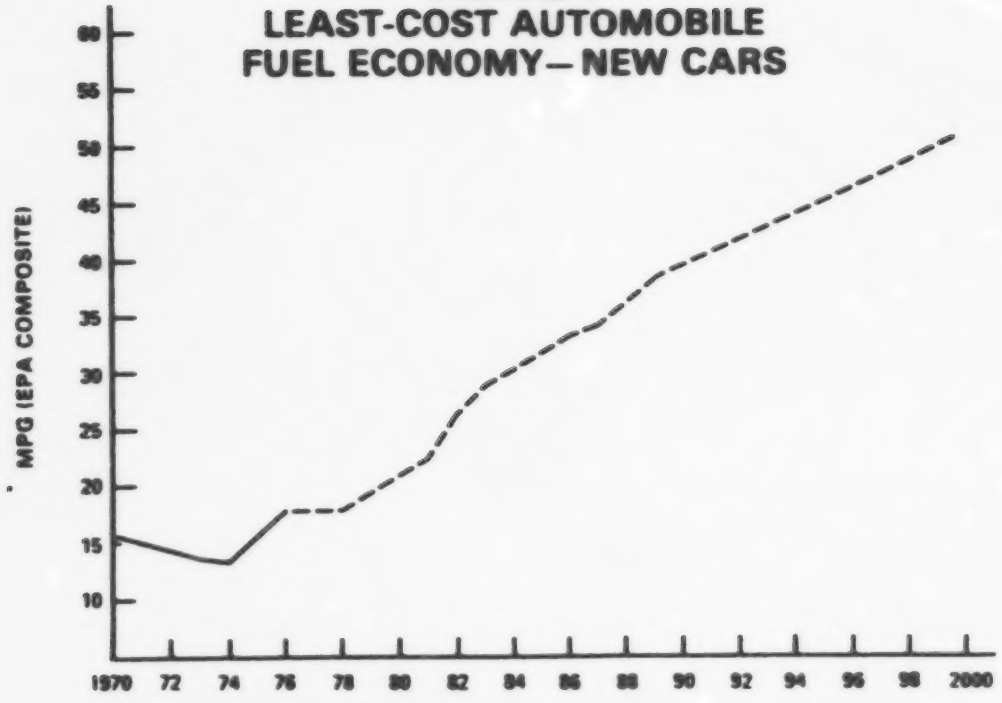
The technologies needed by the light truck fleet to increase fuel economy are quite similar to those used for automobiles, though tailored to the needs of pickup trucks, vans, and 4 wheel drive vehicles.

Aircraft efficiency improvements are abundant and can be introduced in the normal turnover of the fleet of commercial aircraft. For example, the next generation of commercial aircraft is expected to use 30 percent less fuel per seat mile of travel than the planes they replace. Similar improvements are expected from another generation of aircraft that will become available in the 1990's. Anticipated improvements in heavy truck technology are less dramatic than in automobiles because these vehicles have been designed to minimize total operating cost for some time. However, throughout the balance of the century, incremental improvements in engine, chassis, material selection, and aerodynamics are expected to produce worthwhile savings.

Buildings

Least-cost energy use in buildings, (shown in Figure 7), reveals a different pattern from that in transportation. Most of

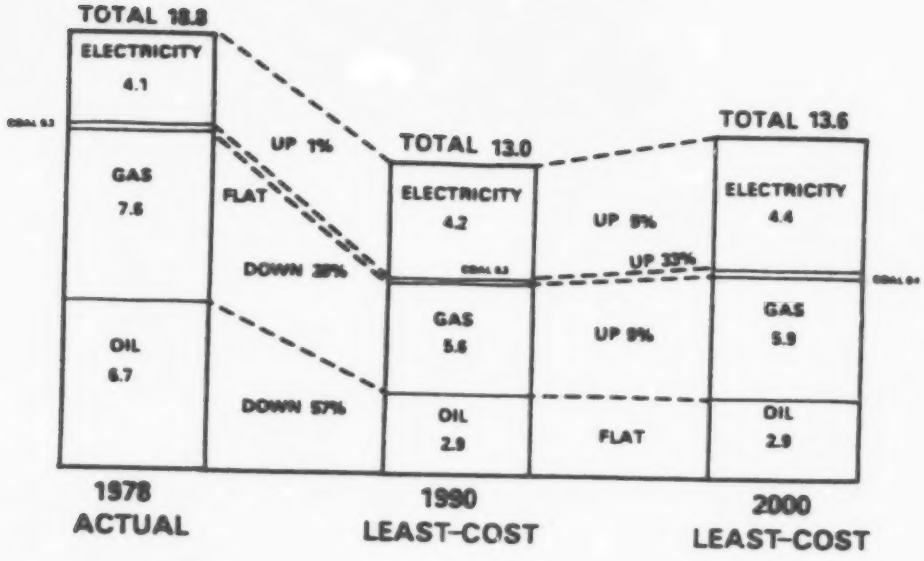
FIGURE 6
LEAST-COST AUTOMOBILE FUEL ECONOMY— NEW CARS



SOURCE: SOCIETY FOR AUTOMOTIVE ENGINEERS, FOR CARS 1970 TO 1976, MELLON INSTITUTE PROJECTIONS THEREAFTER

FIGURE 7

LEAST-COST
ENERGY REQUIREMENTS
IN THE RESIDENTIAL/COMMERCIAL SECTOR
(IN QUADRILLION BTU'S)



the energy which is consumed in buildings between now and the end of the century will be consumed in buildings that already exist. Consequently, the most important feature of the least-cost strategy in buildings is the retrofitting of energy productivity technologies in existing residential and commercial buildings. As a consequence of this investment, total energy use in the residential-commercial sector declines from 18.8 quadrillion Btus in 1978 to 13.8 quadrillion Btus in 1998, even though the number of housing units is projected to increase by 18.4 million, and the amount of commercial space is projected to expand 42 percent. By 1998 the retrofit activity could be physically completed. If so, gradual growth in energy use would resume. However, because the new buildings would be much more efficient than the typical 1978 building stock, total energy use grows rather slowly (less than 1 percent per year) to 13.6 quadrillion Btus by 2000.

Furthermore, changes in the least-cost mix of fuel use in buildings are significant. Oil use declines drastically during the 1980's owing to a combination of the retirement of some existing oil heated units and their replacement by units heated with other fuels, and to the retrofitting of existing oil heated units with energy productivity technologies. Gas use declines through the 1980's even though the number of gas hookups increases (See Table 1). Installation of more efficient gas furnaces and the retrofit of existing units with structural improvements results in the use of 62 percent less gas per unit. Gas use resumes its slow growth in the 1990's. Electricity use increases modestly in buildings throughout this period. These totals reflect the net effect of retrofit of electric resistance heated residences; much greater use of heat pumps and high efficiency construction in new residences; increased use of household appliances driven by higher incomes; and installation of more efficient appliances, particularly refrigerators and lighting. Renewable energy sources -- in particular solar thermal, water heating, and space heating -- continue to be relatively small fractions of total energy use in this period

because it was assumed that competition between technologies occurs on a non-subsidized basis. These technologies do not appear to be competitive on this basis though they would gain market share if the tax credits they currently received were considered in the analysis.*

TABLE I
Space Heating Market Share by Fuel Type
In the Least-Cost Strategy

	1978 Actual	1990 Least-Cost	2000 Least-Cost
Residential (Millions of Units)			
Gas	46.3	53.7	59.6
Oil	16.2	11.7	10.9
Electricity	11.4	26.9	33.1
Total	73.9	92.3	103.6
Commercial (Billions of Square Feet)			
Gas	12.4	24.0	39.9
Oil	13.1	6.1	4.6
Electricity	4.1	12.8	13.3
Total	29.6	42.9	57.8

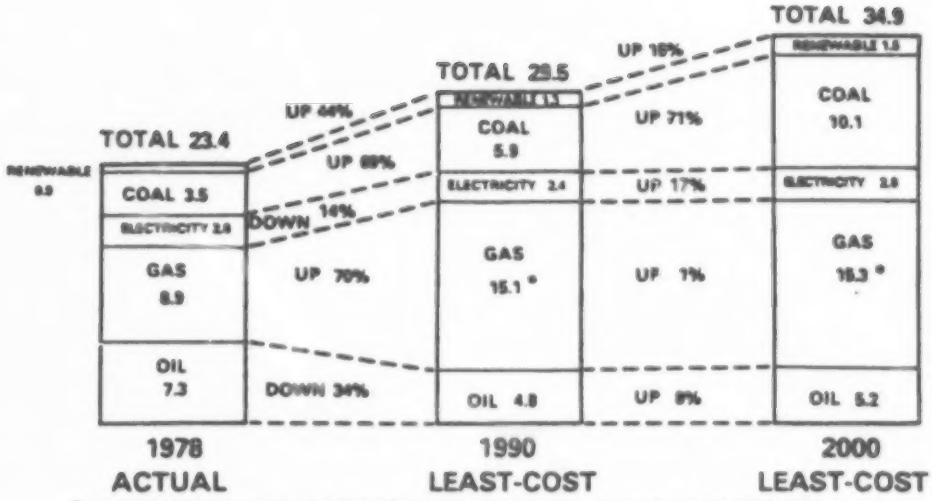
Industry

Under least-cost conditions, industrial use of energy is the one major requirement which continues to increase throughout the century. Total use in this sector, shown in Figure 8, increases

*This finding must be interpreted with great care because the renewables competed in this analysis against average electricity costs rather than marginal costs, which are much higher. Moreover, residential end use technologies are not permitted the depreciation and investment tax credits routinely accorded business property, which tends to make the fuel forms more competitive than they would be with consistent tax treatment. Future refinements of the study methodology will address these issues.

FIGURE 8

LEAST-COST
ENERGY REQUIREMENTS
FOR THE INDUSTRIAL SECTOR
(IN QUADRILLION BTU'S)



* INCLUDES 3.0 QUADS COGENERATION INPUT IN 1990 AND 4.1 IN 2000 INCLUDING ALL DECENTRALIZED GENERATION. TOTAL INDUSTRIAL ELECTRIC CONSUMPTION IS 3.0 QUADS IN 1978, 3.1 QUADS IN 1990, AND 3.8 QUADS IN 2000

from 23.4 quads in 1978 to 29.5 in1990 and 34.9 by 2000. This is partly driven by the fact that industrial production was projected to increase an average of 1 percent per annum more than the Gross National Product. In addition, this total growth in energy may somewhat overstate requirements since only those technologies that can be readily identified -- principally conversion or efficiency improvement devices -- are considered in this analysis. Additional changes are possible through total redesign of the industrial production processes that may change the demand for energy services. However, these changes are not yet included in this analysis.*

As in the buildings sector, oil is relatively non-competitive for most applications in industry. Consequently its use declines throughout the 1980's and is used primarily for feedstocks, construction, and other industrial uses for which substitution was not analyzed (See Table II). This pattern continues through the end of the century, as the combustion use of oil is phased out and other uses grow more slowly. Gas, on the other hand, increases rapidly through the 1980's for both combustion applications and for use in gas turbine cogenerators that provide electric power and steam on-site. These systems provide both the steam and electric power requirements of major process industries, as well as excess electricity which is exported back onto the electric grid. However, by the 1990's the cost advantage which enables gas to compete effectively against the grid for the generation of electricity and against coal for thermal applications has diminished, and gas use increases very little for this period.

* This work is scheduled for completion in early 1982.

TABLE II

Least-Cost End-Use By Fuel Type
In The Industrial Sector
(Quadrillion Btu)

	1978 Actual					2000 Least-Cost				
	Oil	Gas	Coal	Elec	Renew	Oil	Gas	Coal	Elec	Renew
Steam	2.08	2.11	.81	--	.93	.61	6.52	2.72	.02	1.53
Direct Heat-Int	.47	1.35	--	--	--	.06	2.35	.29	--	--
Indirect Heat	.84	.84	--	--	--	.05	.62	.89	--	--
Indirect Heat/Coal Capable	.39	1.03	.22	--	--	.04	.85	.63	--	--
Machine Drive	.29	.36	--	2.19	--	.35	.28	.14	3.83	--
Electrolytic	--	.02	.01	.51	--	--	.04	.35	.43	--
Space Heat	.17	.23	.02	.01	--	.02	.19	.03	.18	--
Other Industrial	3.04	2.99	2.48	.06	--	4.08	4.43	5.01	<.63>	--
Total Industrial	7.28	8.93	3.54	2.77	.93	5.21	15.28	10.06	2.83	1.53

An examination of the industrial use of centrally generated electricity indicates an interesting trend. During the 1980's, U.S. industrial consumption from the grid actually declines on a net basis due to the export of electricity from cogeneration activities to the grid. Although industrial use of electricity is up, consumption from central generating stations is down 15 percent during this period. However, for the same reason that growth in gas and cogeneration increase less slowly in the 1990's, the use of central station electricity resumes its growth in the 1990's and on a net basis returns to 1978 levels by 2000.

The major increase throughout this period is in the use of on-site coal as an industrial fuel. That use increases consistently through the 1980's and 1990's so that by the year 2000, it is almost three times as large as it is today. Also increasing, although somewhat less rapidly, is the use of renewable energy sources, which approximately doubles during this same period. This emerges in the form of on-site use of biomass as a fuel to produce steam in plants, primarily in the paper and pulp industry for which this fuel is available. There is negligible use of solar thermal or photovoltaic technologies in these estimates, which are based upon present costs of these technologies.

Aside from the continued construction of entirely new industrial facilities which have different energy use characteristics, some major trends in energy technology markets emerge. One trend is the increased purchase of coal consumption equipment for industrial sites: low-Btu gasifiers, atmospheric fluidized bed boilers, and high efficiency conventional boilers. Another major trend is the installation of cogeneration units on the sites of major steam-consuming industrial firms. The most competitive cogeneration system is a gas-fired turbine that generates electricity, and then uses the waste heat from the turbine to make steam. Both the electricity and steam are used by the company, with any excess electricity being sold to the

electric grid. Because this system can operate at nearly 70% efficiency compared to 30-40% efficiency for centralized electrical generation plants, it can often produce electricity and steam at lower costs even after allowing for any difference in reliability of the alternative ways of delivering the service. For these particular projections, it is assumed that any electricity at the plant site can be sold back to the utility grid at the utility's avoided cost (which we calculated to average 95% of the average industrial price) -- which enables the plant to maintain a favorable ratio of steam to electric loads.

The other major trend implied by these figures is the consistent application of a wide variety of incremental technologies in many different service sectors. These include various kinds of heat recovery technologies; improved motor controls which reduce motor electric use; process control technology; waste heat recovery technology; a wide variety of minor process changes; and numerous other technologies.

The implication of the results is that in all three consuming sectors, scarcity is not the problem; abundant options exist to meet the United States' energy service needs. Not only are substitutions for currently-used fuels technically available, in reality they are less costly than using more of the fuels like oil that have been considered essential and irreplaceable. Contrary to much conventional wisdom, using more energy on the one hand, or sacrificing comfort and economic growth on the other, are not the only alternatives available to the American people. Neither are the options simply choices among oil, gas, coal, solar, or electricity from central nuclear or coal plants. If the nation shifts from a political paradigm, driven by scarcity, to an economic paradigm for its energy system, the total amount of fuel used is much lower than traditional U.S. energy forecasts have projected. This is because thousands of other non-fuel technologies compete to help deliver the desired

services. Growing human needs and wants are met with very modest increases in fuel use, demonstrating that the popular conception that "energy is scarce" is more likely just a myth.

This provides evidence that there is a weak case for the kinds of government intervention, central energy planning, and public subsidies for various energy technologies that were justified by the myth of energy scarcity. The U.S. is probably energy sufficient today if we considered all means of meeting energy service demand. This finding suggests that government energy policy would be more effective if it sought to encourage new business formations generally, to stimulate the employment of risk capital generally, and to foster enhanced competition and consumer choices. It looks like it will be costly in the future, far more so than it has been in the past, to politically promote individual sources such as synthetic fuels, coal, solar, conservation, or nuclear, or to prescribe where oil and gas should be used. This analysis demonstrates that such a multitude of choices exists that consumers, acting in their own self-interest, would produce a more positive net national outcome.

The analysis was, of course United States based. Using it to comment on the Canadian energy situation may be foolhardy, since I do not know much about the dynamics of the energy situation in Canada. The value, if there is any, is not in the specific numbers or particular technology penetrations that are applicable to the United States. The value is in the approach we used to view energy. I believe that approach is worth consideration by the Canadian community.

From what I have read and heard of the studies emanating from Canada, I find the same penchant for focusing on Btus of oil, gas solid fuels and electricity that we found in the U.S. I also find an almost total preoccupation with reducing imported oil as the overriding objective of all energy policy. I have attempted

to show in the U.S. case that these two focuses have led the country to make decisions that have increased the cost of energy services to the consumer and actually slowed down progress towards reaching the energy goals.

The worth of the analysis we carried out in the United States is the concentration, first on what energy services are required for a productive economy -- now and in the future -- and then looking at all the options available to meet those services. These options need to include technologies on both the the supply (oil, gas, coal, nuclear, hydro, synthetics) and the demand side (auto efficiency, new industrial processes, cogeneration, etc.). Such an approach could have at least two effects for Canada. First it could help show where policies (e.g. subsidies for conservation, fuels or synthetics) are running contrary to minimizing the cost to consumers and two, provide information to industry as to which energy-related technologies will provide the best return on investment. I believe these are essential steps toward a goal of erasing energy as a major obstacle in achieving a healthy growing economy and improving the welfare and security of the people of Canada.

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ENERGY CONSERVATION

RETROSPECT AND PROSPECT

- The Industrial Sector -

AN ADDRESS BY:

Carl A. Wolf, Jr.

Chairman of the Coordinating Committee

of the Voluntary Task Force Program

for Industrial Energy Conservation

Ottawa - December 2, 1981

Industrial demand today is about 29% of the total national demand for secondary energy. The industrial sector is a key component in Canada's efforts to promote energy conservation and to limit dependence on foreign energy sources.

I am pleased to be able to report that industrial energy conservation in Canada has been mobilized, is effectively organized, and is currently making a noteworthy contribution to the national effort. Industrial energy efficiency improvements are currently avoiding energy demands equivalent to more than 50 million barrels of crude oil per year.

The industrial energy conservation effort in Canada is organized and administered through the "Voluntary Task Force Program for Industrial Energy Conservation". This program, which is voluntarily administered by industry, encourages, monitors and reports on energy conservation throughout the manufacturing sector. The program accounts for 84% of the secondary energy used within the manufacturing sector - or 24% of the total national secondary energy demand. The list of more than 500 companies represented by the programs reads like a "Who's Who in Canadian Industry".

The program had its beginning in 1976 when ten industry sectors voluntarily committed to energy conservation goals. These

goals were expressed in terms of efficiency improvement targets relating the Btu's required to produce a unit of production in 1980 to the number of Btu's that were required to manufacture the same production output in 1972.

The original target was to achieve an average efficiency improvement of 12% across all industry by year-end 1980. This was exceeded in 1979. By year-end 1980, the actual average efficiency gain was 15.4%. New goals have now been voluntarily committed to increase this to 23% by year-end 1985.

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INDUSTRIAL ENERGY EFFICIENCY GOALS & PERFORMANCE

(% efficiency improvement vs. base year 1972)

SECTOR TASK FORCE	1980 GOAL	1979 PROGRESS	1980 PROGRESS	1985 GOAL
Chemicals	17.0	22.0	22.4	31.0
Electrical & Electronics	15.0*	21.8	20.3	20.0
Farm & Industrial Equipment	15.0	n/a	10.8	TBD
Ferrous Metals	3.3	2.4	4.7	7.1
Food & Beverage	15.0	10.7	20.4	23.5
General Manufacturing	New	New	(0.3)	12.5
Industrial Minerals	10.0	9.6	11.3	16.9
Machinery	15.0	14.6	19.4	22.0
Mining & Metallurgy	5.8	3.6	7.4	15.0
Non-Prescription Drugs	New	New	New	TBD
Petroleum Refining	17.0	16.5	18.0	25.0
Plastics	New	15.7	17.4	13.1
Pulp & Paper	12.0	13.7	17.2	30.0
Textiles	11.0	21.1	22.3	25.0
Transportation (Mfg.)	15.0*	5.9	8.6	25.4
Wood Products	New	New	17.5	15.0
Weighted Task Force Totals	12.0	13.0	15.4	23.0

* Based on prior methodology which has been revised.

It should be emphasized that the goals and achievements that are shown do not lend themselves to comparisons between Task Forces. It would be erroneous to conclude for example that the Chemicals sector is more conservation oriented than the Mining & Metallurgy sector just because their % improvements are higher. Opportunities and constraints vary widely between sectors and the effort required for a 1% improvement in a metals industry may be many times what would be required in another sector.

It is valid, however, to analyze the pace at which each sector pursues its own goals.

The progress to date (i.e. a 15.4% efficiency improvement) is avoiding an annual energy demand that is roughly equivalent to the total output of a new tar sands plant (i.e. 137 k BPD COB).

Marc Lalonde has effectively summarized the progress of the industrial program to date when, in reference to the Task Force Program, he publicly said:

> *"It is important to emphasize that we are getting these results without the need for a regulatory program. The program is proceeding on a voluntary basis and is paying off handsomely at minimum cost to government and without the need for government interference in business decisions. I believe it is an excellent illustration of the fact that, given clear signals from government, industry will respond in a manner that is fully consistent with our national energy objectives."*

When viewing industrial energy demand and conservation, it is important to understand that "Industry" is really a broad mixture of sub-sectors which are unique in their individual energy uses. They vary greatly in their energy conservation opportunities, constraints and motivations. A steel producer, for example, has bery little in common with a food processor when it comes to energy use.

One way of dealing with this broad mixture is to differentiate between large energy intensive firms and the smaller more labor intensive. As a "rule of thumb", a dividing line can be considered at the level where energy represents 10% of a company's total cost of manufacturing.

Those firms whose energy costs are above 10% of total manufacturing costs are generally more energy conscious because of the substantial impact of energy costs on their businesses. Canada's energy intensive industries are, to a large extent, basic resource upgrading industries which are subject to competition by foreign suppliers and world price standards for their products. Thus, they are limited in their ability to pass on higher energy costs to their customers.

The smaller, more labor intensive companies are generally not as aware of the contribution that energy conservation can make to their earnings - now or in the future. In many cases, these

firms are shielded from foreign competition and thus have a greater ability to pass through increases in energy costs.

If one looks at the year-end 1980 reports by the Task Forces, it can be seen that 92% of the total energy consumption of all sectors was used in six sectors:

Chemicals

Ferrous Metals

Industrial Minerals

Mining & Metallurgy

Petroleum Refining

Pulp & Paper

These same six sectors delivered more than 90% of the energy "savings" reported by all sectors.

The remaining ten sectors, while having less impact on energy use and savings, are also important in that they have a direct labor force that is many times the employment in the "Big 6".

The unique contributions of each group (i.e. the energy intensive 6 - or the labor intensive 10) should be recognized. If industry's contribution to the national effort is expected to only be Btu avoidance, then the emphasis can almost exclusively be placed on the "Big 6". If, on the other hand, industrial

conservation is to be emphasized as a "pull through" vehicle to encourage Canadian workers to save energy at home and on the road, then the "labor intensive 10" become a focal point.

I would suggest that, as has been the case to date in the Voluntary Task Force Program, a synergism results when both groups are involved and are cooperating one with the other. Canada needs the active involvement of all participants -- but -- expectations as to what each can contribute must be realistic.

Let's look at the future:

As energy prices escalate, we can expect that industrial energy conservation will be an even more significant means toward minimizing production costs. The impact on the large energy users will be substantial. They will react almost immediately in an attempt to implement what had previously been marginal return energy conservation projects. However, energy price escalations will substantially increase their operating costs and thereby reduce cash flows. Higher prices will drain capital to the point where conservation projects may be stalled due to lack of funding. Since future conservation gains will require capital investments, it may be necessary to implement programs which alleviate the shortage of investment capital.

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The smaller energy users will see the energy component climb as a percent of their cost of manufacturing. Energy awareness will be more pronounced and efforts to improve energy efficiency will intensify. However, in many cases, these smaller firms lack the technical manpower and expertise to identify and implement energy savings projects. Programs to provide them with technical training and assistance will be even more in demand.

The importance of R&D to discover and develop new more energy efficient processes and equipment will increase. Take for example the recent break-through that is represented in Union Carbide's UNIPOL process for the production of polyethylene. This new process requires only 25% of the energy and 50% of the capital investment of other commercial processes. With increased energy and capital costs, such process innovations promise handsome returns via energy savings, competitive advantage and licensing income.

As energy prices escalate, one can expect that industry's R&D on energy efficiency will intensify. R&D will, however, be largely developmental and concentrate on improving existing processes. Industrial firms will continue to find it difficult to justify and staff basic R&D. Thus, innovation in fundamental areas, like the replacement of distillation by novel low energy techniques, will continue to rely on academic research or government funded studies.

While on the topic of R&D, the capital costs of pilot plant studies are increasing. Government financial assistance may be needed to offset the costs of these facilities.

What then will be industry's contribution to the energy conservation effort in the future? We can, first and foremost, cite the 1985 goals that are in place. These targets have been built up from the commitments at individual plants. As such, they are the best available expression of five year potential.

They certainly have more validity than academic forecasts based on extrapolation from a limited number of generalizations.

Experience has shown that energy conservation goals tend to be exceeded. I do not believe that this is totally due to conservatism i.e. the tendency to build in "comfort factors". My personal experience, and that of others I have spoken to, leads me to believe that it is more a matter of success building upon success. As companies realize the financial returns that result from successful conservation efforts, they are inclined to increase these efforts. As a result, insight grows and more opportunities are uncovered. The consequence is that the original goals, no matter how challenging they may have been felt to be, are exceeded.

This, of course, can question the credibility of the goals that are on record. Is there a need to define and quantify more accurate goals for industry?

First: one should always recall that industrial energy conservation is driven by the company's desire to minimize energy costs. Thus, it is in the company's own best interests to implement energy conservation measures as quickly as possible. No external definition of goals or potentials will have more impact than the company's own desire to cut costs.

Second: the volatile nature of the energy environment is such that any quantification made today will likely be inappropriate tomorrow. I need only go back in history to August 31 of this year to find a dramatically different energy environment in Canada.

Third: the significance of goals is mainly in that they focus effort on the need to improve. Almost any goal will suffice so long as it stimulates such effort and so long as it is revised when required to remain challenging. The absolute accuracy of the goal itself is less important.

I believe that our energy intensive companies are now becoming aware of the need for energy efficiency from a longer term, strategic viewpoint. The opportunism that prompted energy savings in the past is being replaced with the recognition that competitive survival in the future will demand astute energy management. Thus R&D, new process implementations and new plant constructions will be increasingly more justifiable. Dramatic shifts toward greater energy efficiencies will result from these activities.

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Consider for example Union Carbide's new polyethylene plant in Sarnia. Built to 1978 process and design specifications, it is about sixty-five percent more energy efficient than 1972 vintage facilities. And, it is already being converted to employ the UNIPOL process in those process streams where it applies. New plants such as these will provide quantum leaps in energy efficiency.

My expectations remain as they were when I authored the statements in my company's 1980 NEB submission. I fully expect that by the year 2000, industrial energy efficiency will, on average, be at least double what it was in 1972. Indeed, with proper price stimulation, capital availability, and a sound economy, this could occur in the 1990-1995 era. Even this may be an understatement if R&D efforts that are now being stimulated succeed in revolutionizing the key energy intensive processes which currently employ the bulk of industrial energy use in Canada.

Five years ago, our energy conservation expectations were limited. I believe we have now come to realize that industrial energy efficiency is undergoing an evolutionary change. A change that will result in a dramatically different industrial energy use pattern -- as it must if the industrial base of Canada's economy is to survive in the face of world competition.

So what must we do to assure that the industry's energy conservation contributions are maximized in the future:

1. *Build upon and strengthen what we have in place i.e. the Voluntary Task Force Program.*

2. *Make effective use of the industrial success story to motivate other sectors of the economy.*

3. *Raise energy prices to the highest (politically acceptable) levels which do not threaten the competitiveness of Canadian industry.*

4. *Provide (government) financial assistance to assure that reasonable energy conservation investments are not stalled due to capital shortages.*

5. *Improve the information flow and technical training within industry - particularly in support of those industries (companies) who are less technically self-sufficient.*

6. *Promote both fundamental and process related R&D to prompt longer term energy efficiencies and advantage.*

7. *Maintain the candid, cooperative government/industry relationship that has been the foundation of our successes to date.*

The Potential for Energy Conservation in Canada

Presentation by G.T. Armstrong, Conservation and Renewable Energy Branch/ Energy, Mines and Resouces to Seminar on Energy Conservation in Canada - Prospect and Retrospect, Ottawa, December 2, 1981

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Although this presentation will focus on the potential for energy conservation in Canada, I will also discuss progress to date in Canada, and problems of tapping energy conservation potential in the major Canadian end-use sectors.

At the outset, to review the commonly used definitions of energy conservation. The use of these definitions creates a lot of confusion in discussions on energy conservation.

(1) Curtailment, involuntary reduction in energy use - often referred to/in terms such as freezing in the dark, going hot in summer and cold in winter, (the "Reagan/Edwards" definition!)

(2) Voluntary changes in lifestyle associated with changes in the energy situation. Examples are thermostat setback, switch to public transportation, changing of shift schedules in industry and commerce. This definition is sometimes referred to by terms such as conservation approaches, overhaul conservation, reversible conservation.

(3) Economic substitution of conservation technologies for energy in the production of a given level of service. Examples are the use of insulation to replace energy in keeping a given room at 20°C, the use of aerodynamics to replace energy in a five-seater automobile, the use/ of recovered heat for process heating. Sometimes referred to by terms such as energy productivity, technical fix, least-cost energy services, energy efficiency irreversible conservation.

This third definition - energy productivity - has been the dominant definition used in Canadian policy and program development since 1974.

Reasons for interest in energy conservation in Canada:

- Energy cost and price trends - the major factor
- Social and environmental concerns over energy supply projects
- Geographical/political - east consumption/west production
- Energy supply security, particularly oil.

This third definition - energy productivity - has been the dominant definition used in Canadian policy and program development since 1974. Yes, there have been some initiatives encouraging lifestyle changes, but an objective review of the work of OEC and CREB would show that the emphasis has been, and increasingly so, on energy efficiency. Our policy and program development work on energy conservation defined in this way has indicated that:

Energy is demanded as in input into the production of energy services such as mobility, comfort, process heat. Hence energy demands should not be viewed sectorally in aggregate terms (Figure 1) but rather in energy service terms.

(Table 2 on energy services in Canada)

Technically many conservation "technologies" can substitute for energy in the production of energy services.

- significance of this substitution? e.g. the energy substitution effect of insulation installed in Canada over the past five years.

(Table 1 on conservation technologies, approaches in the buildings sector)

As energy prices rise relative to conservation and other technologies, substitution of these and other technologies for energy is increasingly economic.

(Residential energy price table - (Figure 3)

Economic degree of substitution depends on investment criteria and energy prices used (market, replacement-EMR's reference prices).

Currently conservation is typically/"producing" energy at less than 50% of the cost of producing energy from new supply projects.

For example virtually all industrial conservation investments fall below $20.00 per barrel of oil equivalent ($3.50/GJ) saved on the basis of a 10 year investment life, and a 7 percent real discount rate.

Thus despite real energy price increases the actual use of conservation technologies in Canada lags behind what is cost-effective* from a national perspective. That is, too many resources are being dedicated to the production of energy services.

- barriers to economic deployment of conservation technologies are numerous:

  Knowledge of conservation opportunities (many opportunities giving/better than 2 year paybacks at 1976-1980 prices are still virtually untouched)

  Energy pricing

  Market imperfections (eg. rental/lease situations)

  Fiscal environment - taxes, subsidies

  Investment criteria

  Institutional weaknesses - e.g., energy service companies virtually non-existent

* Unless otherwise stated cost-effective means competitive with new energy supplies using realistic lives for each investment and similar discount rates (7 percent) for all investments (demand and supply)

In summary we have found significant technical and economic potential for substituting conservation technologies for energy inputs (and for substituting other energy inputs for oil) in the production of energy services but we have also found that tapping this potential faces some formidable barriers.

Conclusions from Canadian work on energy demand management are similar to those from studies in other countries. Some key "country" studies to this point are:

EMR (OEC) Energy Conservation in Canada (EMR 77-7) - 1977
IIED Study (Leach), UK, 1979
Shell (Beijdorff), Europe, 1979
Mellon Institute (Sant), USA 1979
SERI (Ottinger, Sawhill) USA, 1980
JECC studies, Japan, 1978 - 1981
STU/SIND industrial studies, Sweden, 1976 - 1981

Results of Canadian conservation initiatives over the past 7 years.

. 1974-1979 - adjustment of information flows but little deployment of conservation technologies, approaches

. 1979-1981 - evidence of substantial action but still well below economic potential. Over the past seven years Canada has made some innovative contribution to energy conservation policies, programs and technologies, including:

.
Industrial Task Force Programs
.
Energy bus program for industry, commerce and agriculture
.
Design and construction of low/energy buildings
.
Development of insulation installation "standard"
.

Successful implementation of appliance labelling program

•

Development of high efficiency natural gas furnaces (R and D to market in 8 years)

•

Significant R&D on cold weather fuel economy of automobiles

•

Significant demonstration projects, e.g. use of low grade thermal wastes, super energy efficient homes.

These contributions have been publicised in three major international presentations this year on Canadian policies and programs in each of the buildings, transport, and industrial sectors.

. 1981 on - The major question to be addressed in the rest of presentation.

Analytically, much remains to be done as estimates of cost-effective conservation are still "soft" in each sector and the problems of tapping cost-effective conservation are not well understood. Furthermore there is little knowledge of the aggregate effects on energy demand, i.e. the interaction of energy demand increasing and/decreasing effects. For example, to what extent will increased unit auto fuel economy be offset by increased auto usage?

Energy Conservation Potential and Problems

Buildings (30 percent of secondary energy usage, excluding industrial buildings)

The presentation will concentrate on residential buildings, accounting for about 17 percent of secondary energy usage.

Residential Buildings

- current stock (8.3 million units)
- new stock additions, 1981-1990 (1.8 million units)
- demolition, 1981-1990 (0.5 million units)
- energy use in today's residences is dominated (70%) by the space heating element of space comfort. The low grade energy requirements of space heating underlies the significant conservation potential/in the sector.

Dominance of existing stock (80% of 1990 stock already built)
Importance of not adding to retrofit stock

Existing Residences

From a 1973 base, conservation potential for space heating is estimated to average around 50 percent at market prices expected over next 5 years, at investment returns of 7% real or better.

(Figure 4)

- Rapid decline in marginal cost-effectiveness above 50-60 percent reduction (from 1973 base)
- Potential is being re-evaluated using a 1981 base

Status of realising this potential from 1973 base

- 12-15%

Problems

- Information inadequate (general, technical), for householders and decision makers; retrofit activities to this point seldom undertaken optimally
- Conservation investments do not seem to be a consumer investment priority
- Quality of work

- Lack of comprehensive retrofit and energy service companies
- Rental situation disincentives
- Role of fuel conversion uncertain
- Lack of knowledge of investment criteria used in sector

Importance of the PITRC evaluation and the ECAP element of PCRP for policy and program development

New Residences

Compared with a typical 1973 new residence, potential of 70-85% reduction in space heating/energy at market prices expected over next 5 years at investment returns of 7% real or better.

- Reduction of 100 - 150 X 10^9 joules per unit per year, to a use level of 20 - 40 X 10^9 joules, i.e. to about 20 to 40 Mcf of natural gas for space heating (Figure 5)

- Relative unimportance of purchased energy for space comfort in these super energy efficient residences

Status of realising this potential from 1973 base

- Average 20-30% improvement per unit; range of 0-95 percent.

Choice of heating systems: roles of electricity and gas (gas has difficulty competing as unit/space heating demands drop below 40 Mcf per year)

Problems

- Minimising first costs instead of life cycle costs
- Inadequacy of information (general, technical)
- Uncertainty over role of codes
- Quality of work
- Lack of knowledge on consumer attitudes to home purchasing
- Most analysis neglects comparison with supply options
- Energy service companies virtually non-existent

Hot Water, Appliances and Lighting for New and Existing Residences

Brief review of potential and trends (Figure 6)

- Hot water
- Major appliances
- Lighting

Negative effects of efficiency improvements on space heating, i.e. higher efficiency appliances provide less waste heat to home interior.

Commercial Buildings

Institutionally similar in some aspects to industrial sector-greater heterogeneity than residential buildings
Space heating is not as dominant as in case of residences but space/comfort still the major energy user
(50% compared with 70%)

Similar potential to residential

- economics probably better for a given energy use reduction
- barriers to attainment of potential more difficult to overcome

New Commercial Buildings

Potential improvement, from 1973 base, of over 75 percent - essentially using improved designs with no net increase in capital cost

- Examples - Ontario Hydro, Gulf Canada Square, LEBDA, new EMR building

Progress since 1973 of 30-40 percent (reduction in total energy use per unit of floor space).

Existing Commercial Buildings

Potential varies widely but from a 1973 base appears to be about 50% (of total energy use) at market prices expected over next 5 years at investment returns of 7% real or better.

Status of realising this potential from 1973 base

- Limited knowledge in aggregate - PWC stock achieved 26% reduction in energy use per unit floor area over 1975-1976 to 1979-1980 period.

Problems

- Lack of incentives
- Restrictive investment criteria
- Inadequate information base
- Inadequate information flows (general, technical)
- Slow emergence of companies specializing in the provision of energy services for the commercial sector.

Industry (30 percent of energy usage, excluding energy supply industries and all "non-energy" usec)

Energy use is dominated by the process heat energy service (75 percent of sector energy use). Other important uses are:

- Specialised industrial processes, e.g.

coal in iron and steel

electricity in aluminum production

- Electric drive

Conservation potential

- A very difficult sector to analyze given the vast array of plants and processes. Another major difficulty is industry's reluctance to have the public sector analyze the energy efficiency of plants and processes.
- Despite these problems a range of studies and reports indicate that energy use per unit of output could be reduced by about 35 percent, from a 1973 base, at market prices expected over the next five years, and at investment returns of 7 percent real or better (Table 2). Potential varies widely among sectors (highest in chemicals, pulp and paper and lowest in mining and metals industries). (Figure 7)

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Industrial conservation task forces have target of 23 percent reduction over 1973 - 1985 period

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Over the 1973 - 1990 period a reduction of 25-35 percent appears feasible

.

Over 1973-2000 period a reduction of 50 percent appears feasible, given expected price trends and technological developments

.

Generally savings estimates track econometric forecasts, but it is unlikely that a "price only" strategy will give forecast results.

Stages of industrial conservation (for 1972-1990 period)

- housekeeping, maintenance 10% reduction in energy use per unit of output
- retrofit (increased use of insulation, controls and heat exchangers) 10 - 20% " " " " "
- new low energy processes 5% " " " " "

Status of Realizing Potential

Steady progress since 1973 (12-15% reduction to the end of 1980) and major companies now entering second stage, with some movement on the third stage.

Problems

- Information flows, although improving, remain inadequate
- Not yet a top corporate priority
- Confidence of achieving results without dislocating production (importance of demonstration, case studies)
- Pricing
- Investment conditions (capacity utilization, etc.)
- Investment criteria
- Lack of energy service companies operating in the industrial sector
- Effects of changing industrial mix uncertain
- R and D (some evidence of a 1981 turn around)

Transport (25 percent of secondary energy usage)

Energy use is dominated by the mobility energy service provided by automobiles (50 percent of total) and by all road mobility (80% of total). Furthermore sectoral energy usage is now 99% petroleum based.

- air, rail, marine share the final 20 percent of sector energy use, with air the most rapidly growing market segment.
- energy efficiency of transport modes varies considerably.

Sectorally there are many opportunities for the application of conservation technologies (Table 3). Over all transport modes, conservation potential at market prices expected over the next five years, and with investments giving 7 percent real return or better, is in the 40-50 percent range.

Autos

Emphasis is on new autos given auto energy use, the highest sectoral potential for conservation, the relatively short life of autos (10 years), the fact that most miles are travelled in the first four years of auto life, and the difficulty of tapping the potential in existing autos.

Conservation potential for new automobile fleet/fuel economy is 60-75 percent over the 1973 - 1995 period (16 mpg average to 50 mpg average) at costs of conservation technologies competitive with new supply (Mellon Institute Study) and with no downsizing of autos after 1985.

Under these assumptions the U.S.A. in 1995 would use 30 percent less energy in autos and trucks than in 1979 (Mellon study). If fuel economy improvement of new automobiles and trucks ceased in 1995, total fuel consumption of cars and trucks would continue to fall absolutely through 2000.

In the case of Canada it is estimated that similar assumptions would result in about the same total transport energy/usage in 1979 and 2000 (with continued growth in vehicle stock and little modal shift).

(Figure 8)

Status of realizing this potential

40 percent improvement over 1973-1981 period (16 mpg to 26 mpg) in tested fuel economy in new vehicles) BUT only 25 percent improvement in on-road fuel economy (a major factor in Canada in poor fuel economy in cold weather)

Improvements past 50 mpg are technically possible at a cost similar to that of producing alternative fuels, and together with acceptance of further down-sizing past 1985 and some reduction in performance, recent USA studies estimate that by 2000 fuel economy for/new autos could be in the 60 mpg to 100 mpg range.

Problems

- Information
- Pricing
- Tax fuel costs (even after recent budget)
- Free employer provided parking (98% of driving commuters pay less than $1/day of which 92% get free parking).
- Less attractive fiscal incentives for product change and R & D investments compared with those available for the fuels industries.
- Other auto industry investment priorities, requirements, etc.
- Competition restraint (employment concerns restraining imports of energy efficient autos)
- Uncertainty about the role of alternative fuels (alcohols, propane, CNG)

Non-Auto Modes

The potential for efficiency improvements in non-auto modes is not as great as it is for autos. Nevertheless an improvement of about 30 percent is expected over the 1980 - 1990 period and with continued improvement through the 1990's. Some switching to modes of higher efficiency is also expected (eg., autos to transit), and an overall improvement in load factors. But the overall impact of these improvements in system energy efficiency is likely to be less than 10% of that from improvements in modal efficiencies (autos, trucks, etc.)

Strategy for realising energy conservation opportunities

Analysis of the nature of the potential, and the effectiveness of alternative mechanisms for realizing the potential

Information - to reinforce price effects and to aid energy consumers to adjust to price trends

Pricing levels and structures

Institution shaping

- National coordination of efforts - involving other levels of government, utilities, etc., concerned with energy demand management in Canada
- Development of interest/action on sale of energy services (with utilities, companies such as Canertech - importance of Canertech)

Incentives (CHIP, AECIP)

Regulation (fuel economy standards, building standards)

Overall Impacts of Conservation Trends and Potential

Difficult to predict, particularly effects of changing demands for energy services

(Figure 9)

Oil

- Slightly lower aggregate result to NEP, with transport usage slightly lower, and residential/commercial/industrial
- With aggressive, *cost-effective conservation, renewables and alternative fuels efforts, oil usage in 1990 could be significantly lower than NEP 1990 "forecast".

Total Primary Energy (TPE)

- Little change in 1980 total primary energy demands (oil, gas, electricity, coal) by 1990 (± 1%), with current programs
- Definite negative trend for aggregate oil, gas, electricity, coal primary energy usage with aggressive, cost-effective, conservation and renewables efforts.

Cautions

- Very preliminary analysis
- Significant dependence on success of existing and potential conservation/substitution programs and policies, and response of private sector to opportunities (compare with problems on the supply side where timing of impact is a critical problem)
- Aggregate effects uncertain given the presence of continuing demand increasing factors (household formation, incomes, consumer preferences: air conditioning, travel, etc., industrial mix changes, increasing energy intensity in certain industries)

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* The aggressive cost-effective scenario has been developed to give an idea of the difference between where current trends seem to be heading (the CREB Forecast) and what might be attained with an aggressive conservation and substitution stragegy. The "aggressive" scenario does not include all effects of cost-effective actions as in each sector some of these can only take effect beyond 1990. It should be viewed as a barely feasible "target" in the 1980-1990 period, and as an indication of post-1990 trends.

Beyond 1990-2000

Our analysis at this point has concentrated on the period to 1990 but is now beginning to explore the possibilities beyond 1990, particularly in the 1990-2000 period. Some indications of the possibilities are:

- Buildings
  - continued retrofit of most buildings constructed before 1990
  - high energy efficiency in all new buildings constructed after 1990
  - increased use of electricity and renewables in meeting residual energy demands
- Industry
  - continued retrofit of plants existing before 1990
  - high energy efficiency in all new plants and increasing attention to "energy clustering" of new industrial complexes to take advantage of energy complementarity (waste heat streams/material waste, cogeneration)
  - increased renewable energy use
- Transport
  - continued improvement in auto fuel economy through technical progress and through more efficient mix of autos (e.g. city car use)
  - improved overall urban design to improve overall urban transportation efficiency
  - substitution of telecommunications for physical movement
  - increased sectoral usage of alternative fuels and continued decline in oil usage (in 2000, 30-40 percent less than in 1980)

Overall, as existing technologies continue to be applied past 1990, as new technologies are developed, and as energy prices approach replacement cost levels "CREB technologies" will take an increasing share of the energy services market through 2000. For example, in buildings there will be approximately a 50 percent increase in energy services demand between 1980 and 2000* but little change is expected in the sector's absolute aggregate use os oil, gas, electricity and coal over the 1980-2000 period.

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* As the volume of enclosed built area increases and as demands for space comfort, convenience and other indoor activities increases.

Conclusions

This review of the major energy using sectors indicates significant potential for conservation and to her CREB technologies in the production of energy services. The effect of increased energy prices on the deployment of these technologies is uncertain, but even if one decides that the realization of the potential outlined should be left to market forces operating in the emerging energy price environment, it is important for EMR to consider the effects of conservation, etc, on conventional energy sources - gas, electricity, oil and coal.

TABLE 1

CONSERVATION TECHNOLOGIES AND APPROACHES IN BUILDINGS

CONSERVATION TECHNOLOGIES	CONSERVATION APPROACHES
INSULATION	TEMPERATURE LEVELS (SPACE HEATING AND COOLING, HOT WATER)
AIR TIGHTNESS	AIR CHANGE LEVELS
HEAT RECOVERY FROM EXHAUST AIR STREAMS	LIGHTING LEVELS AND SYSTEMS (SUCH AS TASK LIGHTING)
LIGHTING	MAINTENANCE PROCEDURES
CONTROLS (FOR TEMPERATURE, HUMIDITY, LIGHTING, AIR FLOWS)	OFF-PEAK HOUR OPERATION (CLEANING, WORKING CONDITIONS)
APPLIANCES TECHNOLOGIES	USE OF CONTINUOUS ENERGY CONSUPTION INDICATORS
HEATING (ELEMENTS, E.G. HEAT PUMPS, FURNACES, AND SYSTEMS, HVAC, SOLAR)	
COOLING (ELEMENTS, SYSTEMS)	
FENESTRATION (ORIENTATION, GLAZING/AIR GAPS, SHUTTERS)	
SITING	
INTEGRATED SYSTEMS, E.G. DISTRICT HEATING AND INTEGRATED APPLIANCES	
TECHNOLOGIES CAN PROVIDE THE SAME LEVEL OF SERVICE AT LOWER ENERGY USE LEVELS (SO CALLED "TECHNICAL FIX", ENERGY PRODUCTIVITY)	APPROACHES INVOLVE A CHANGE OF SERVICE LEVEL OR THE TYPE OF SERVICE, BUT MOST APPROACHES STILL PROVIDE DIRECT ECONOMIC BENEFITS TO CONSUMERS AND FIRMS (SO-CALLED "LIFESTYLE CHANGE")

TABLE 2

CONSERVATION TECHNOLOGIES AND APPROACHES IN INDUSTRY

CONSERVATION TECHNOLOGIES

INSULATION - BUILDINGS, PIPELINES
PROCESS EQUIPMENT
STORAGE TANKS

WASTE HEAT RECOVERY -
HEAT EXCHANGE,
UPGRADING, USE

PROCESS CONTROL

COMBUSTIBLE WASTE RECOVERY AND USE

LIGHTING

HIGH EFFICIENCY ELECTRIC MOTORS

THERMAL STORAGE - OFTEN LINKED WITH WASTE HEAT RECOVERY

HEAT PUMPS - OFTEN LINKED WITH WASTE HEAT RECOVERY

HIGH EFFICIENCY COMBUSTION

LOW ENERGY PROCESSES
(E.G. FILTRATION V. EVAPORATION, CONTINUOUS PROCESSING)

COGENERATION

CONSERVATION APPROACHES

DETAILED ENERGY AUDITS

IMPROVED MAINTENANCE (E.G. STEAM TRAPS, HOT WATER LINES, LIGHTING SYSTEMS)

IMPROVED OPERATING PROCEDURES (E.G. PROCESS START-UP, CLOSE-DOWN)

INCREASED PRODUCTION RATES

SCRAPPAGE RATE REDUCTION

WORK SHIFT VARIATIONS

TABLE 3

CONSERVATION TECHNOLOGIES AND APPROACHES IN TRANSPORTATION

CONSERVATION TECHNOLOGIES	CONSERVATION APPROACHES
AUTOMOBILES AND TRUCKS	
IMPROVED ENGINE EFFICIENCES (DIESELS, STRATIFIED CHARGE, ETC.)	SIZE REDUCTION
COOLING SYSTEM	PERFORMANCE REDUCTION
TRANSMISSION	IMPROVED MAINTENANCE
BETTER LUBRICATION	RIDE-SHARING (CAR, VAN POOLING)
MATERIALS FOR WEIGHT REDUCTION	AUTO USE REDUCTION
RADIAL TIRES	DRIVING HABITS
IMPROVED AERODYNAMICS	SPEED LIMITS AND THEIR STRICT ENFORCEMENT
OTHER MODES	
AIRPLANES OF HIGHER ENERGY EFFICIENCY (E.G. MOTORS, CONTROLS, AERODYNAMICS)	SHIFT TO MODES OF HIGHER ENERGY EFFICIENCY
RAIL IMPROVEMENTS (E.G. LRC, TRACK, CONTROLS)	SHIFT TO TELECOMMUNICATIONS FROM PHYSICAL TRANSPORT

FIGURE 1

CANADIAN ENERGY DEMAND
1979

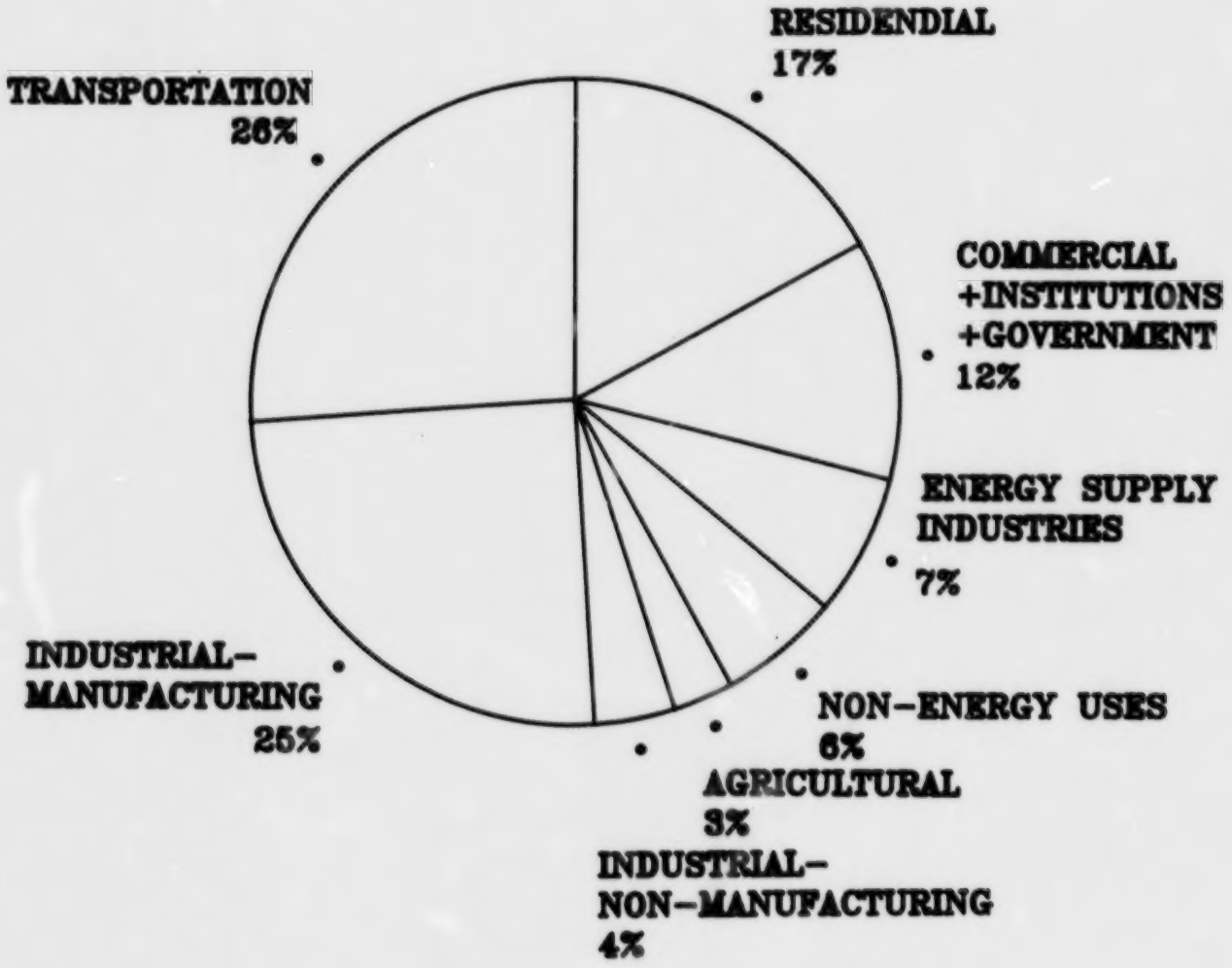
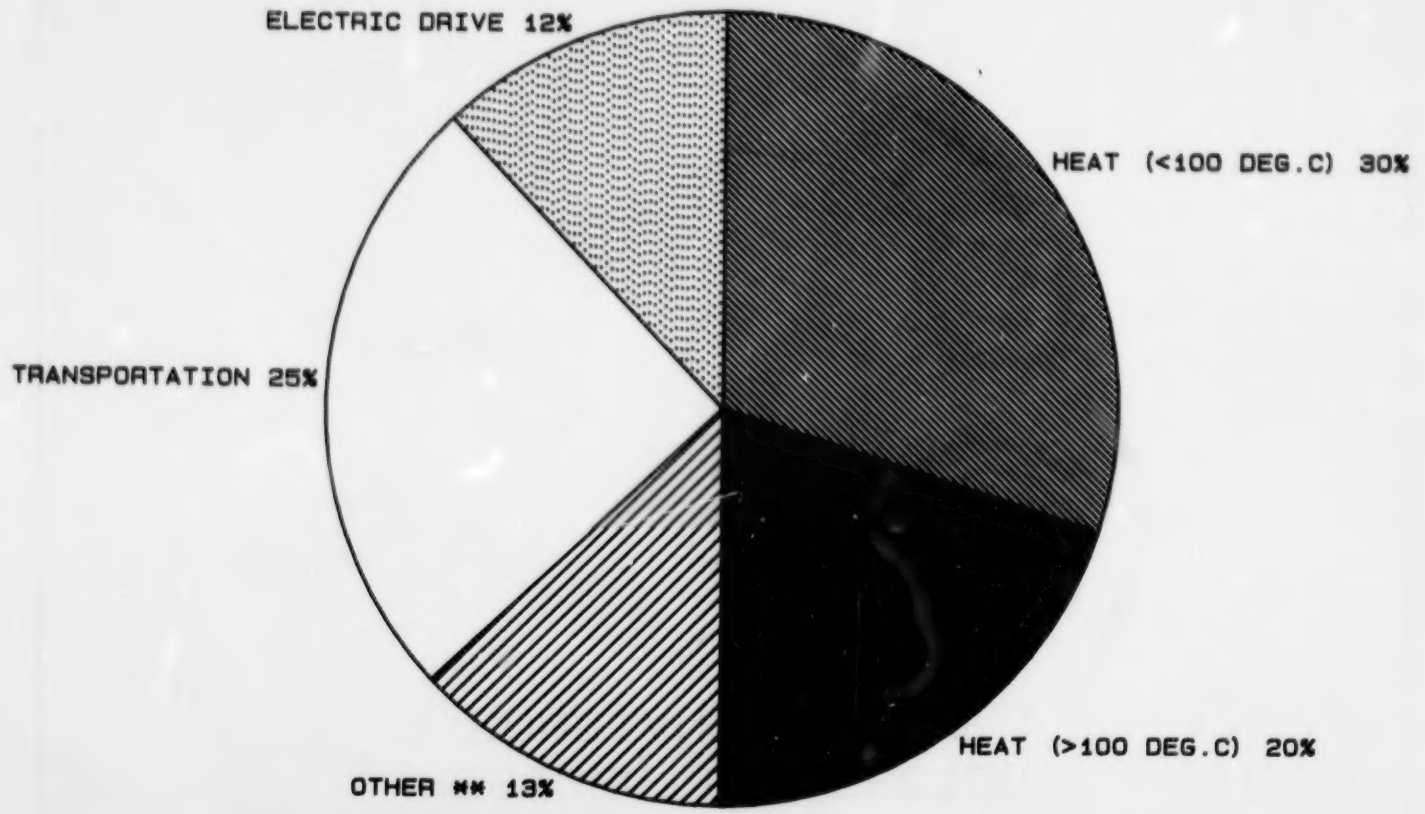


FIGURE 2
ESTIMATED FUNCTIONAL ENERGY CONSUMPTION IN CANADA
(PERCENT OF TOTAL SECONDARY* ENERGY CONSUMPTION)

1981



* EXCLUDING NON-ENERGY (FEEDSTOCKS, ETC.) USES.
** LIGHTING, SPECIALIZED ELECTRIC PROCESSES, COOLING.

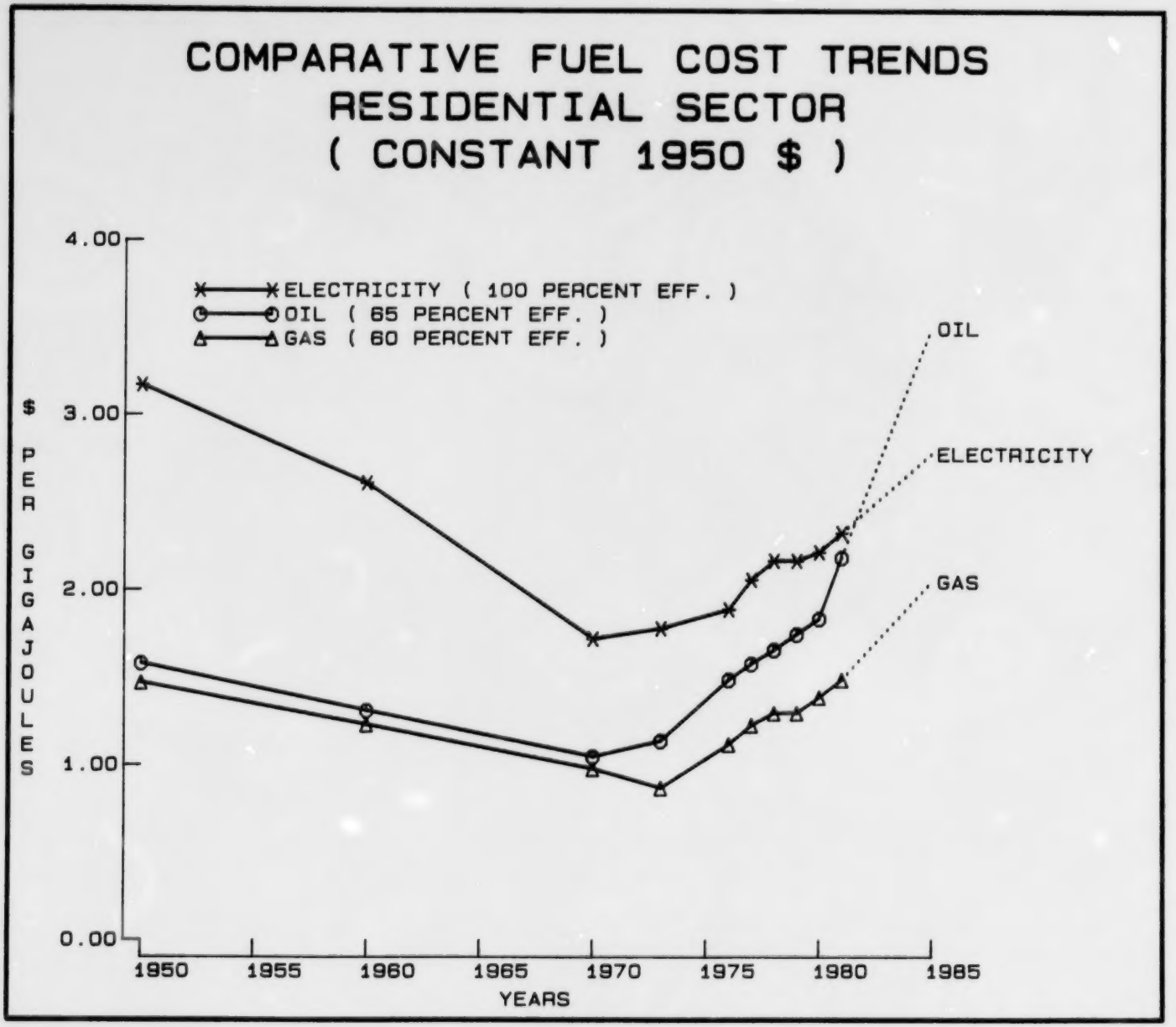
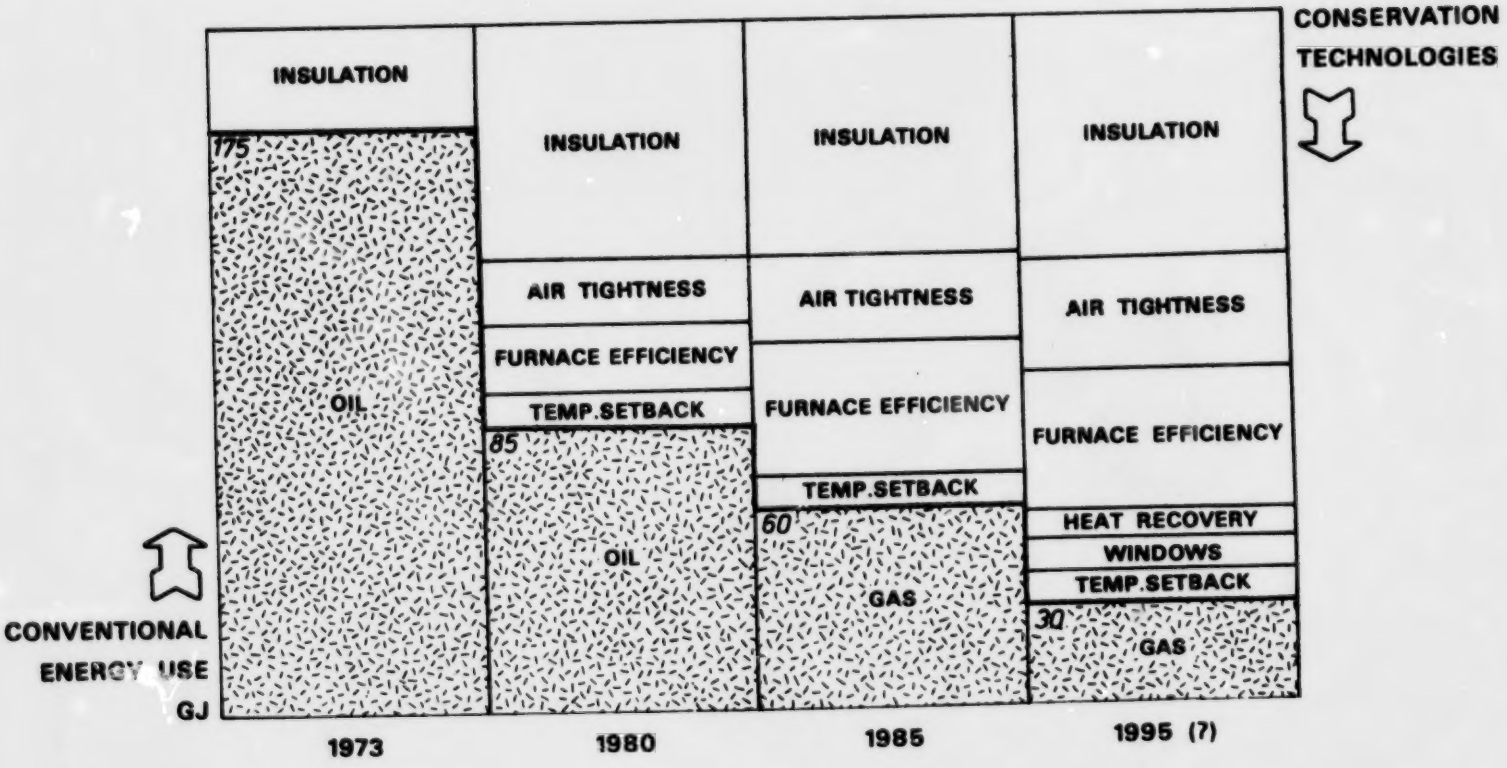

COMPARATIVE FUEL COST TRENDS
RESIDENTIAL SECTOR
(CONSTANT 1950 $)
ELECTRICITY (100 PERCENT EFF.)
OIL (65 PERCENT EFF.)
GAS (60 PERCENT EFF.)
$ PER GIGAJOULES
4.00
3.00
2.00
1.00
0.00
1950
1955
1960
1965
1970
1975
1980
1985
YEARS
OIL
ELECTRICITY
GAS

FIGURE 4

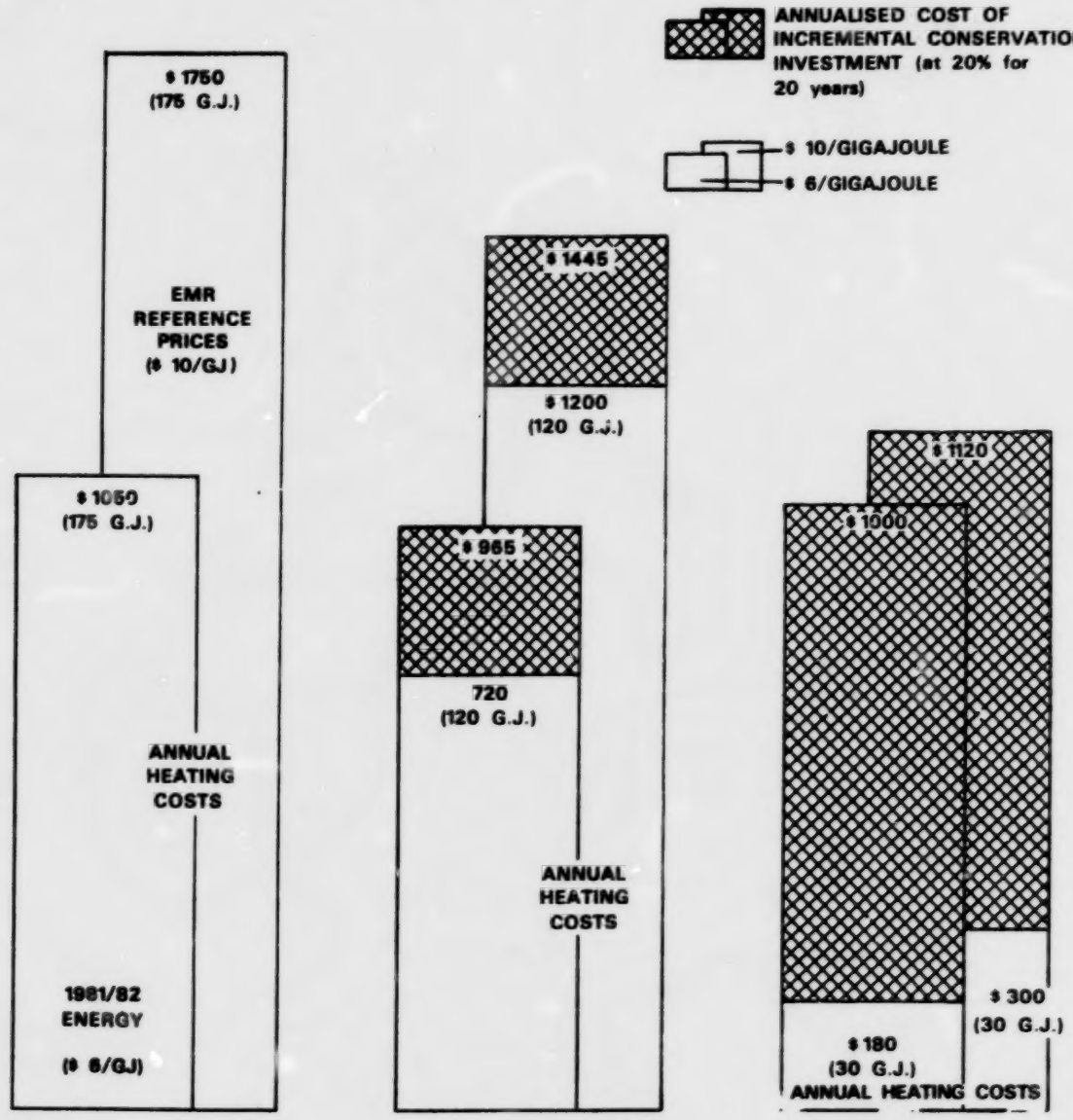
LEAST COST SUPPLY OF SPACE COMFORT ENERGY SERVICE (same level) IN HOUSE BUILT IN 1973



	1973	1980	1985	1995 (?)
INCREMENTAL RETROFIT COSTS (1981 $'s)	—	$2,000	$2,500	$3,000
INCREMENTAL FUEL COSTS SAVINGS (1981 $'s) per year				
-MARKET PRICES	—	400	360	300
-EMR REFERENCE PRICES	—	1,000	580	330

FIGURE 5

NEW HOUSING - SPACE HEATING COSTS (FROM 1973 BASE IN 1981 $'s)



	'TYPICAL' 1973	'MEASURES' 1978	SUPER ENERGY EFFICIENT 1981
CONSERVATION-INCREMENTAL CAPITAL COSTS:		$ 1200	$ 4000
ALL ELECTRIC HOUSES-REDUCED UTILITY CAPITAL COSTS		$ 4000	$ 11000

FIGURE 6

ENERGY CONSERVATION - PROGRESS AND POTENTIAL
IN MAJOR APPLIANCES, HOT WATER HEATING AND LIGHTING
(INDICE - 1978 = 100)

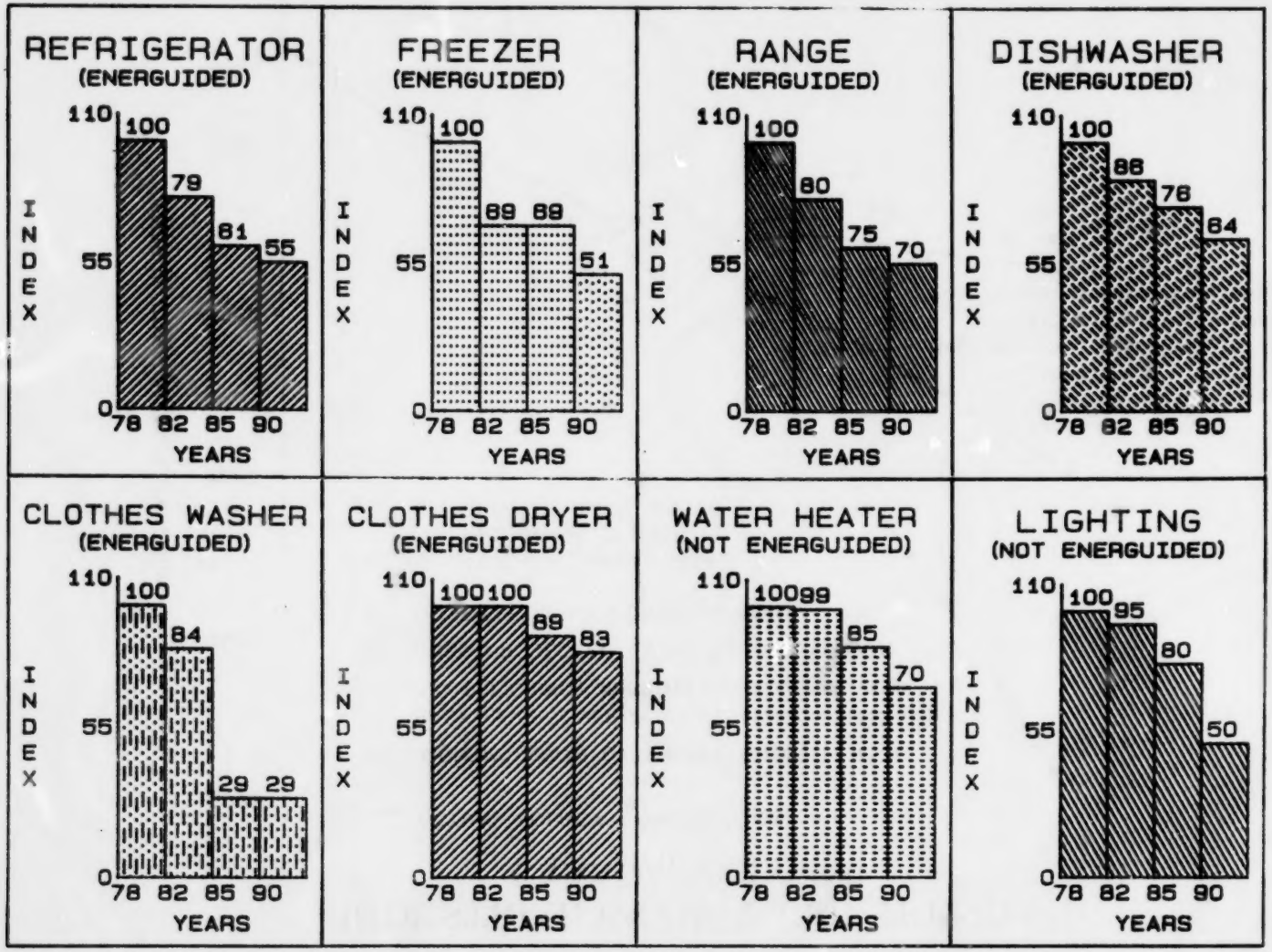


FIGURE 7

INDUSTRIAL ENERGY USE TRENDS
CANADA, 1962 - 1990

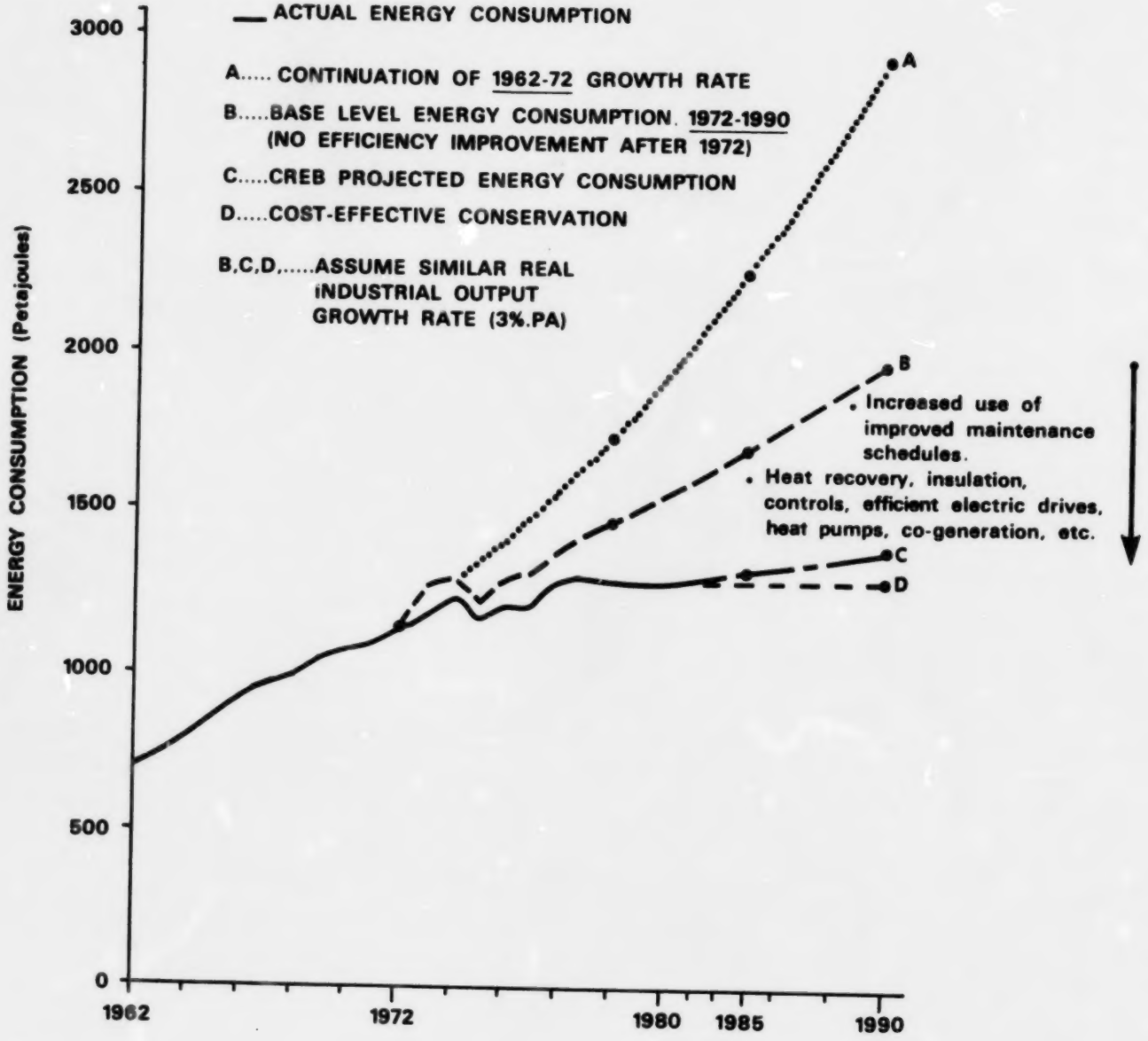


FIGURE 8

ENERGY USE IN TRANSPORTATION

1979 - 2000

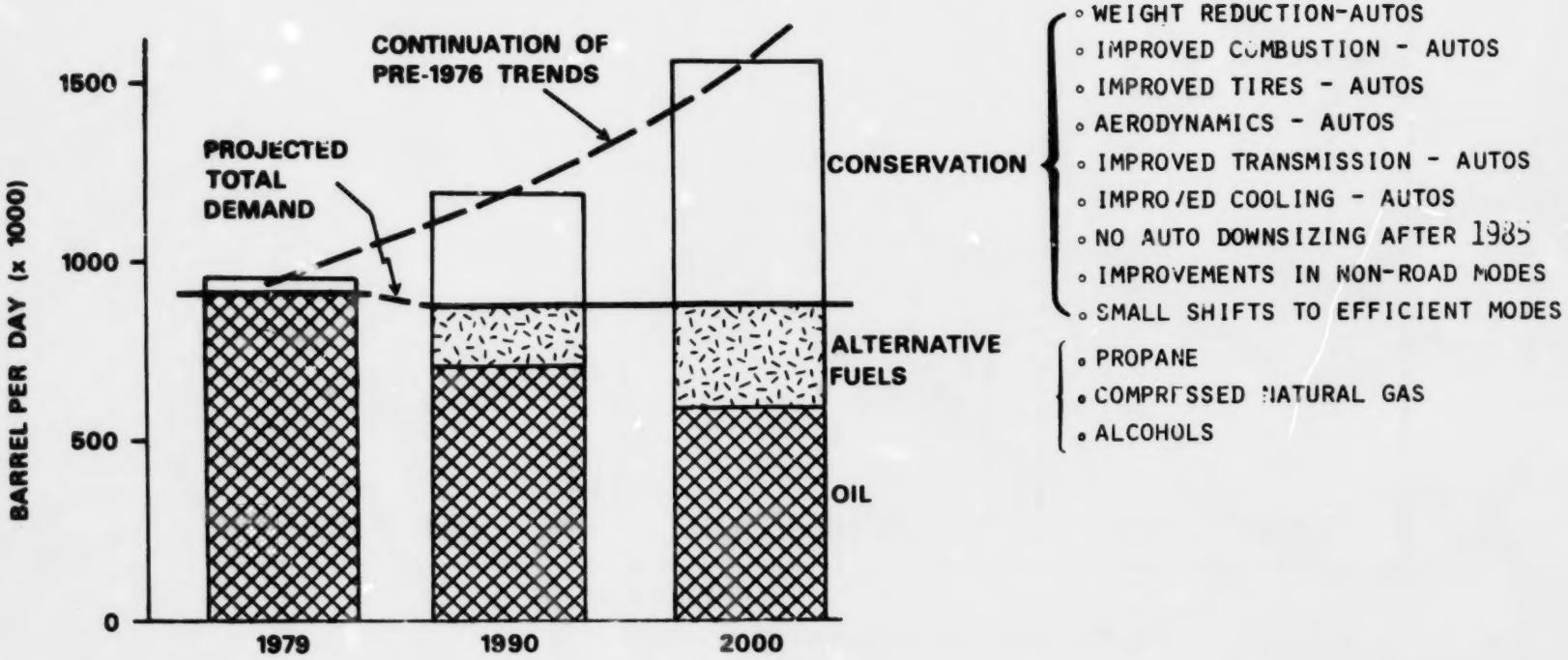
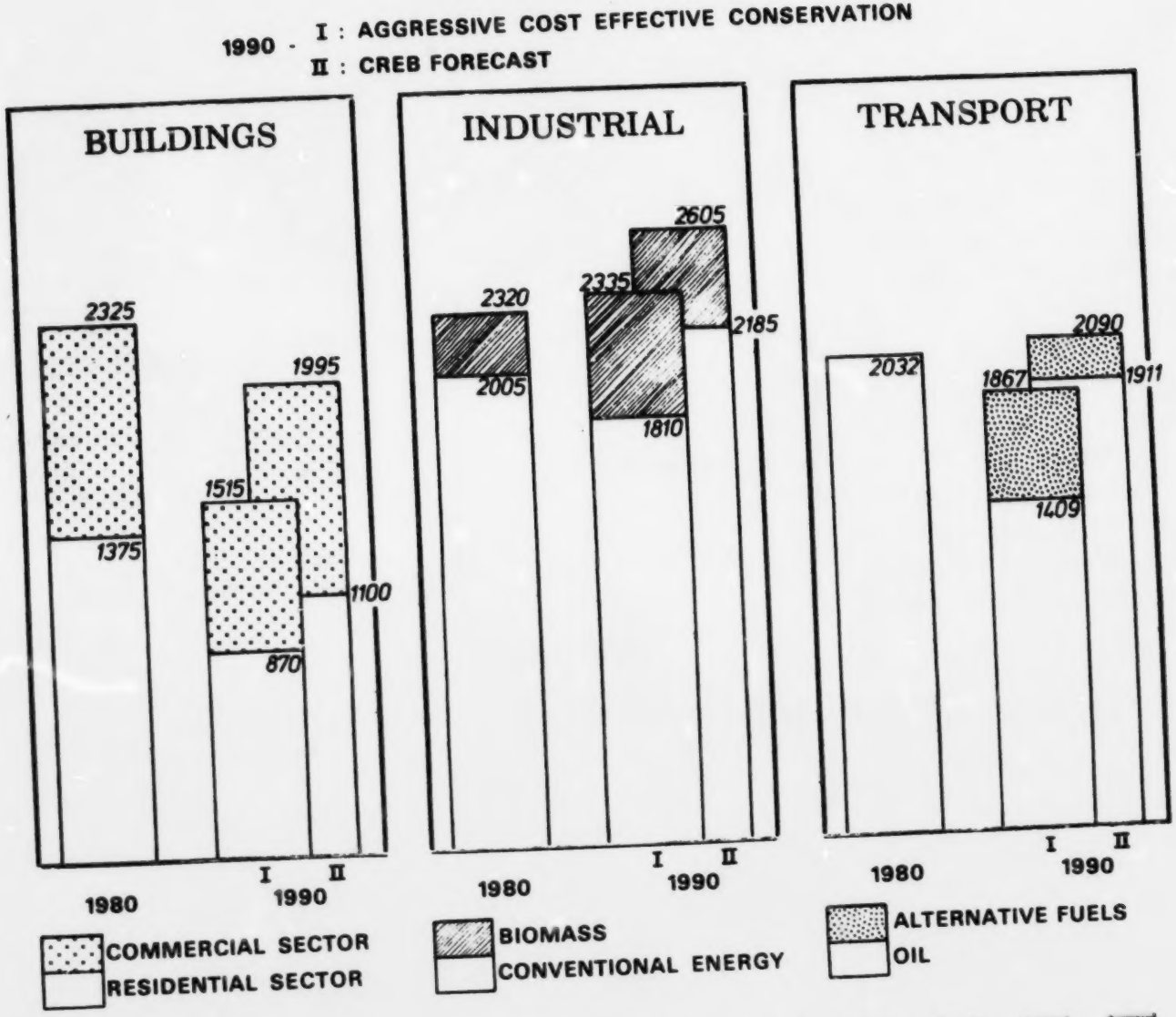


Figure 5

ENERGY USE BY SECTOR IN CANADA
1980-1990
PETAJOULES



BACKGROUND DOCUMENT

for an address by:

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Energy Mines and Resources Canada

to the seminar

ENERGY CONSERVATION:
RETROSPECT AND PROSPECT

Ottawa, 2 December 1981

CANADA'S AUTOMOBILE FUEL CONSUMPTION POLICIES AND PROGRAMS

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Ottawa Canada

for the 3rd International Conference on
Energy Use Management
Berlin, October 1981

CANADA'S AUTOMOBILE FUEL CONSUMPTION POLICIES AND PROGRAMS

Canada is an energy rich nation, and a net exporter of energy. While Canada has surpluses of natural gas, coal, propane, electricity and uranium it has been a net importer of petroleum since the mid-1970's. By 1979 imports of petroleum had grown to 215 Mb/day (thousand barrels/day) whichwas about 12% of Canadian requirements (Figure 1). Canada does have the potential to become self-sufficient in petroleum within a relatively short period of time, and this self sufficiency is the major focus of national energy policy. Self sufficiency can be attained by new or increased oil production from conventional, frontier and oil sands reserves, by substitution away from oil to fuels whicn are more abundant, and by vigorous conservation actions to reduce energy demand.

Canadian consumers have enjoyed lower cost oil products compared to other OECD countries for many years. This was due to the low cost of production of domestic oil supplies, and the relatively low level of government taxation of transport fuels.

The 1973 oil crisis triggered energy policy changes in Canada. Agreements with oil producing provinces were negotiated to gradually increase the price of oil at the well head (this is the principal lever for implementing fuel pricing policies). However, the effects of growing inflation in the 1975-80 period resulted in only a small increase in the real retail price of gasoline. Nevertheless, significant oil sands development and frontier oil exploration began in this period, and comprehensive conservation programs were developed in each use sector. Because of historically low energy prices, little attention had been devoted to energy use and wasteful designs and operations were evident. The combination of the 1973 oil crisis, and the visibly rising world oil price against which Canada was no longer insulated, gave the initial impetus to a change in attitude to the use of energy in Canada. Even though the real price of oil products did not rise significantly, consumers began to find that conservation actions were already economically justified.

Late in 1980 the Government introduced a comprehensive energy policy entitled the National Energy Program. The oil price rises proposed in this policy were cemented by

.../2

federal-provincial negotiations in 1981, and provide for a rapid rise in oil prices in the 1981 to 1986 period. Oil prices in Canada will not exceed 85% of world oil prices or the average price of oil in the United States, whichever is lower.

As oil prices rise, major programs are being implemented to aid consumers in conserving and substituting from oil. These programs include home insulation incentives, new building insulation standards, grants for conversion of furnaces from oil to gas or electricity, and many more.

In the transportation sector, major actions have also been taken, principally focused on road vehicles.

Transport Sector Demand

In Canada in 1979 transportation accounted for 24 percent of total secondary energy consumption, or over 55 percent of petroleum products (excluding petrochemical feedstocks). The share of petroleum consumed by transportation is shown in Figure 2 for the period 1960-1977, in relation to other end use sectors. The increasing share of total petroleum that is consumed in the transport sector has been accentuated in recent years by the backing out of petroleum in other sectors. This trend is expected to continue, and by 1990 it is quite likely that transport will consume between 60 to 70% of petroleum.

The distribution of energy within the transport sector is shown for 1979 in Figure 3. Since 1972 the road fuel consumption share of transport energy has increased from 76.5 to 81%.

Transportation Sector and Conservation Programs

The transportation sector offers considerable scope for energy conservation. It has been estimated that energy demand growth in this sector could be reduced to zero over the period 1980-90 compared to growth of more than 5% in the early 1970's. These potential savings rely heavily on improvements in automobile and light truck fuel consumption, in response to government standards. Other

.../3

significant savings are expected from changes in technology and operations of the truck and air industries, and improvements in urban transportation systems. Because of the large and increasing share of petroleum used by transport, there is expected to be continuing pressure on the sector to improve its efficiency.

The average North American automobile had developed by the early 1970's to require almost twice as much fuel per mile as typical European and Japanese models. It was obvious that large improvements in automobile efficiency could be made.

In January 1976, the Canadian Government announced that automobile manufacturers would be required to meet fleet average fuel consumption standards of 11.8 L/100 km (24 miles per Imperial gallon) by 1980, and 8.6 L/100 km (33 MPIG) by 1985, (Figure 7). These levels are identical to those legislated in the U.S. in December 1975, under the Energy Policy and Conservation Act. While this program is similar to the legislated program in the United States, it operates with the voluntary cooperation of vehicle manufacturers. Other objectives for the program are:

1) publication and distribution of fuel consumption ratings;

2) labelling of fuel consumption information on individual automobiles and light trucks.

Because of related regulatory responsibilities for motor vehicle safety and emission standards, the Department of Transport was assigned responsibility for the administration of this program.

The program includes publication of about 2 million copies per year of a Fuel Consumption Guide (Figure 4) which lists the vehicles available in Canada and their fuel consumption ratings. It is distributed through automobile dealerships, provincial vehicle licensing offices and a major banking system. The vehicle manufacturers voluntarily provide the department with technical, sales and fuel consumption data, certifying that the results were obtained in accordance with Transport Canada test procedures. These procedures are virtually identical to the test procedures used by the United States Environmental Protection Agency, except that the city fuel consumption number (Figure 5) is adjusted upwards by 10% to reflect average Canadian on-road conditions in summer driving.

.../4

To verify the data provided by the manufacturers, Transport Canada purchases about 100 vehicles per year and tests these at its Motor Vehicle Test Centre near Montreal, Quebec, and at Environment Canada laboratories in Ottawa. Results indicate generally good correlation between these audit tests on production vehicles and manufacturers' data on prototype vehicles.

Additional Actions Affecting Fuel Consumption

Several other measures have been implemented in addition to the fleet average standards, as it is believed that a truly effective policy must be broadly based. Some provide information to purchasers and owners, while others are fiscal measures.

An excise tax on gasoline of ten cents per gallon (approximately 11% of the retail price) was introduced in 1975; this tax is rebated to commercial users. The tax was reduced to 7 cents per gallon in 1978, and further changed to an "ad valorem" rate in 1979. This tax is primarily a revenue producing tax, which revenue is used to offset expenditures made to oil companies to compensate them for their payments for imported oil at prices above the domestic price.

A graduated excise tax on automobile weight was introduced in 1976. For the first 100 lbs over a threshold weight of 4425 lbs there is a tax of $30.00; for the second 100 lbs, there is an additional tax of $50.00; for the fourth and each successive 100 lbs, the tax is an additional $60.00. The tax is very similar in structure to the gas guzzler tax in the United States. Originally the threshold weight of the tax was to have been reduced by 250 lbs increments each year to a minimum level of 3500 lbs. However, due to difficulties experienced in implementing this tax the progression was halted and the threshold remains stable at 4425 lbs for the time being. This tax is currently under review as it affects very few automobiles, now that they have been downsized.

An Air Conditioner Tax of $100 was implemented at the same time as the weight tax, because this energy consuming option was regarded as a luxury in the Canadian climate. Installation rates had been accelerating rapidly in the early seventies and the option was becoming increasingly common in smaller cars, where its energy impact is significantly greater than in large cars.

.../5

Canadian Provincial Governments have nearly all made substantial reductions in speed limits for the purposes of both safety and fuel economy. This measure is estimated to save about 2% of road fuel. Speed on major divided highways is limited to 100 km/hr, while 2 lane highways are generally posted at 90 km/hr. Federal vehicles are restricted to a maximum speed of 90 km/hr. The Canadian trucking industry strongly supports these lower speed limits.

SPEED LIMITS IN CANADA

Roadway Type	Speed Limit (Km/hour)
Freeways	up to 100*
Rural Highways	70-90
Urban Arterials	50-60
Local Roads	up to 40

*110 Km/hour in Alberta on two major expressways.

The provinces also have jurisdiction over annual vehicle registration fees, and some have recently changed the structure of their fees to become more progressive with weight or engine size. Although not as large as European registration fees, Canadian fees range typically from $24 per year for a small car, to $80 for a very large car. One province has introduced a retail sales tax which varies from 4% to 8% of the new vehicle purchase price according to the rated fuel consumption.

In addition to these measures the Canadian Government has introduced other measures to encourage consumers to buy more efficient cars, and to use fuel more carefully.

Since 1975 the Federal Government has run a diverse information and education campaign using paid advertising and all media forms. The annual Fuel Consumption Guide has already been mentioned.

The complete listings of fuel consumption from this publication have been used each year in full page advertisements in national newspapers. Several major magazines also report independently on the ratings. Media advertising has also been used to encourage:

- purchase of efficient automobiles

- conserving driving habits

- better vehicle maintenance

- use of alternatives to automobiles

- reduced highway speeds

Much of the information used as background for media campaigns, and much more, is contained in a small 100 page book called the "Car Mileage Book", of which more than a million copies have been distributed. This book tells consumers how to buy, operate and maintain their automobiles to conserve energy. The book also contains ratings of automobile fuel consumption and sheets for recording fuel consumption data.

More recently the ratings and additional data on a computer have been used to provide consumers with a comparison of fuel costs for several new automobiles of their choice, given the annual miles driven, the local fuel cost, the period in years for which the comparison is desired, and the proportion of city to highway driving. This program has proved to generate considerable interest at large exhibitions such as automobile shows and the Central Canada Exhibition. Tests have indicated that it is not appropriate as a phone-in service; this contrasts with a successful phone-in service called "Heatline" which homeowners use to obtain information on home insulation, furnace maintenance, etc.

To bring the benefits of vehicle maintenance and good driving habits to the public's attention, several mileage rallies have been conducted. In these rallies a commuting route is selected and an advertisement is placed asking drivers who use this route to participate in the rally. About twenty drivers are selected and they are asked to record their fuel consumption for a week of commuting. During the following weekend the drivers are given a course in conserving driving habits, while their vehicles are given a thorough tune-up. Fuel consumption ratings obtained after a second week of commuting are compared with these of the first week. Improvements in fuel consumption are typically 10-12 percent for this kind of demonstration. The events are covered by local and national media so that costs are very low for the amount of publicity received.

The federal government's information program is complemented by several other media campaigns run by provincial governments, oil companies, national and regional automobile associations. Of course the major vehicle manufacturers also place heavy emphasis on fuel consumption ratings in their advertising.

.../7

Development of Fuel Consumption Standards Policy

The introduction of the voluntary fuel consumption standards program in 1976 has been described. The background to policy decisions and a description of development to the program will be outlined in the following paragraphs.

The reasons for adopting the fuel consumption standards program was heavily influenced by the large potential for energy savings by efficiency improvements to light duty vehicles, and by the introduction of a similar program in the United States. In both countries, the existence of a common test procedure for emissions certification made the extension to fuel consumption (by the carbon balance method) relatively simple. Fuel consumption testing by both companies and government increased to cover the requirements of both emissions and fuel consumption programs.

The cost of administration of the program is dwarfed by the value of energy savings and the costs borne by manufacturers (and of course consumers) in re-tooling and production. Various studies of the program have confirmed that cost-effectiveness of the program until 1985, and recent work has estimated that standards of 40 to 45 miles per gallon are economically justified by 1990. The impact on total fuel consumption by the transport sector is dramatic. The absolute reduction in automobile fuel demand by 7% from 1979 to 1990, results in a growth of only 3.6% in sectoral demand. This projection includes significant activity and vehicle population increases in the forecast period. Beyond 1990 the impact of the program extends so that sectoral demand growth remains fairly flat (Figure 6).

In response to the importance of this program the Government made further decisions affecting the program. In 1978, the Government directed that legislation be prepared to enforce the parts of fuel consumption program. The legislation was to be based on manufacturer's self-certification rather than on Government testing and approval, and would effectively mandate the program requirements in the existing voluntary program, but with fuel consumption standards to be established by regulation, with appropriate penalties for failure to comply with the standards.

Further statements on this legislation were made on the opening of the last session of Parliament and in the National Energy Program of 1980. To quote from this document:

"..., conservation in the transportation sector requires more than behavioural changes and adjustments on the part of vehicle owners. It requires a major change in vehicles, so they become more efficient. Canadian motorists do not drive their cars more miles per year than most Europeans; but there are more cars per capita in Canada, and the cars we drive use much more fuel per mile. By world standards, Canadian automobiles waste fuel. The National Energy Program includes new legislation that would enable establishment of mandatory mileage standards designed for Canadian needs and conditions, to give the motor vehicle industry the basis for design and production in the 1980's".

"In Canada, standards have been voluntary. However, it has become increasingly clear that the automobiles constructed to suit United States legislative standards do not necessarily reflect the realities of vehicle operation in the colder Canadian climate, nor do they take cognizance of the relation between Canadian fuel types, feedstocks and motor vehicle fuel requirements. As part of a general conservation and liquid fuels policy, Canada will develop its own standards".

The Motor Vehicle Fuel Consumption Standards Act was introduced into Parliament as a White Paper (discussion draft) in the spring of 1981.

The Act is intended to be proclaimed in two stages. The first part, may be proclaimed as soon as regulations are developed.

This part requires that vehicles to be sold in Canada be the subject of a "fuel consumption number". Manufacturers conduct controlled tests for each type of vehicle which they produce, and register the fuel consumption numbers so obtained with the Minister. These numbers are the basis of fuel consumption information labels carried by each vehicle and for the information set out in Transport Canada's Fuel Consumption Guide. A further use of the numbers is in the calculation by the Minister of the fleet average fuel consumption for the classes of vehicles which each company sells in Canada.

The classes of vehicle to which the Act applies are to be prescribed by the Minister, and are intended to be broad, e.g. all passenger automobiles comprise one class.

.../9

The current voluntary program has set out company average fuel consumption standards for automobiles for each year until 1985. Companies can improve the fuel consumption of their vehicles by increasing the share of sales of their more efficient vehicles or by improving the technology of each model as they are periodically re-designed or replaced.

The Government intends that these standards, and post-1985 standards yet to be developed, remain voluntary unless it is evident that companies are not complying with them. If a serious non-compliance situation develops, then the remaining sections of the Act may be proclaimed to mandate the standards and assess penalties for non-compliance. Compliance with the voluntary standards can be determined by information contained in reports from companies to the Minister, as required by the first part of the Act. Figure 7 lists the standards to 1985.

Automobiles and light trucks and vans, which would be covered by the Act, consume about one-third of Canada's refined petroleum products. The motor vehicle fuel consumption program, as set out by the Act and standards, is an essential part of the National Energy Program, and complements other conservation and off oil initiatives in the residential, commercial and industrial sectors.

One goal of the National Energy Program (NEP) is to make Canada self sufficient in petroleum. An estimate of the way that oil supply and demand might go to achieve this objective is illustrated in Figure 8, which is taken from the NEP statement description. The vigour of the conservation and substitution programs necessary to achieve the absolute petroleum demand decrease are obvious. Much reliance has been placed on the program to convert oil furnaces to gas and electricity, and the home insulation program, in addition to the motor vehicle program. Driving the vehicle program is the steadily rising price of gasoline (Figure 9) forecast for the 1980's.

The fuel consumption program has already had significant impacts on vehicle design and market share. The way in which new efficient vehicles affect the fuel consumption of the entire automobile fleet is shown in Figure 10. The chart shows the relation between new car fuel economy as measured by the laboratory test procedure and on-road survey results, as well as the standards and the on-road efficiency of the whole automobile fleet. Figure 11 shows the progress of the companies in meeting the fuel consumption standards in Canada. On average the requirements of the program are being exceeded. Trends in the characteristics of vehicles sold in Canada in the 1975-80 period are shown in Figures 12 to 15.

As would be expected, the sales-weighted fuel consumption, inertia weight and engine displacements have all decreased significantly. However, the interior volume of automobiles has remained almost unchanged - manufacturers have increased efficiency without impacting passenger and cargo carrying capacity. There is evidence from these charts of the kinds of improvements which are planned for the 1980's. The gap between the sales-weighted characteristics of North American made vehicles and imported models is expected to close. The cost to North American manufacturers is largely a function of the rate at which new technology is introduced. The number of years in which tooling and plant can be amortized has been reduced by the necessity of retiring products in much shorter timeframes than before. To a large extent the pressure of government regulation of fuel consumption seems to have been replaced by pressure from consumer demand for more efficient cars. This is evidenced by the large rise in import market share in the last 2-3 years.

Future Direction of Fuel Consumption Policy

The basis of fuel consumption policy in Canada will likely change over the next few years to comprise new developments, especially in the area of alternative liquid fuels and new petroleum supply. The question which springs to mind, faced with the increasing cost of marginal additions to fuels supply, is what can be gained in increased conservation at lower costs than new supplies. Figure 16 shows estimates of the cost in 1980 dollars of alternative liquid fuels products (net of road taxes) in relation to the price of products from imported oil. It is very likely that these costs of incremental liquid fuels supply will be the yardstick against which vehicle efficiency targets are measured. This is already the case in policy and program analysis for alternative fuels in transportation. In Canada there are significant government incentives to foster the use of propane (of which Canada has a surplus) in road vehicles. These incentives include a federal grant for each vehicle converted and in one province, the remission of vehicle and propane purchase tax.

It can be seen from the figure that the costs of the propane option is substantially below the world price of oil, based on the current conversion and operating costs of propane vehicles. The same situation is true for compressed natural gas (CNG), but major incentives are not yet in place for this fuel, as it is felt that further technology development is required to overcome some shortcomings of this option. The CNG option is however extremely attractive to Canada as there

... 11

are large reserves of natural gas available and a fairly broad gas pipeline system.

Another consideration in the development of fuel consumption policy derives from the structure of the Canadian motor vehicle manufacturing industry. Clearly Canadians would save a large amount of fuel if the vehicle stock were quickly replaced by very efficient automobiles. In the short term these vehicles could not be supplied in adequate quantities by North American manufacturers, and the import share of the market would have to rise even more. The recent negotiation of import quotas clearly demonstrates the importance that governments attach to their respective automotive industries. Fuel consumption policy, along with safety and emissions policy operates within the umbrella of the Canada-U.S. Automotive Agreement, often referred to as the Autopact.

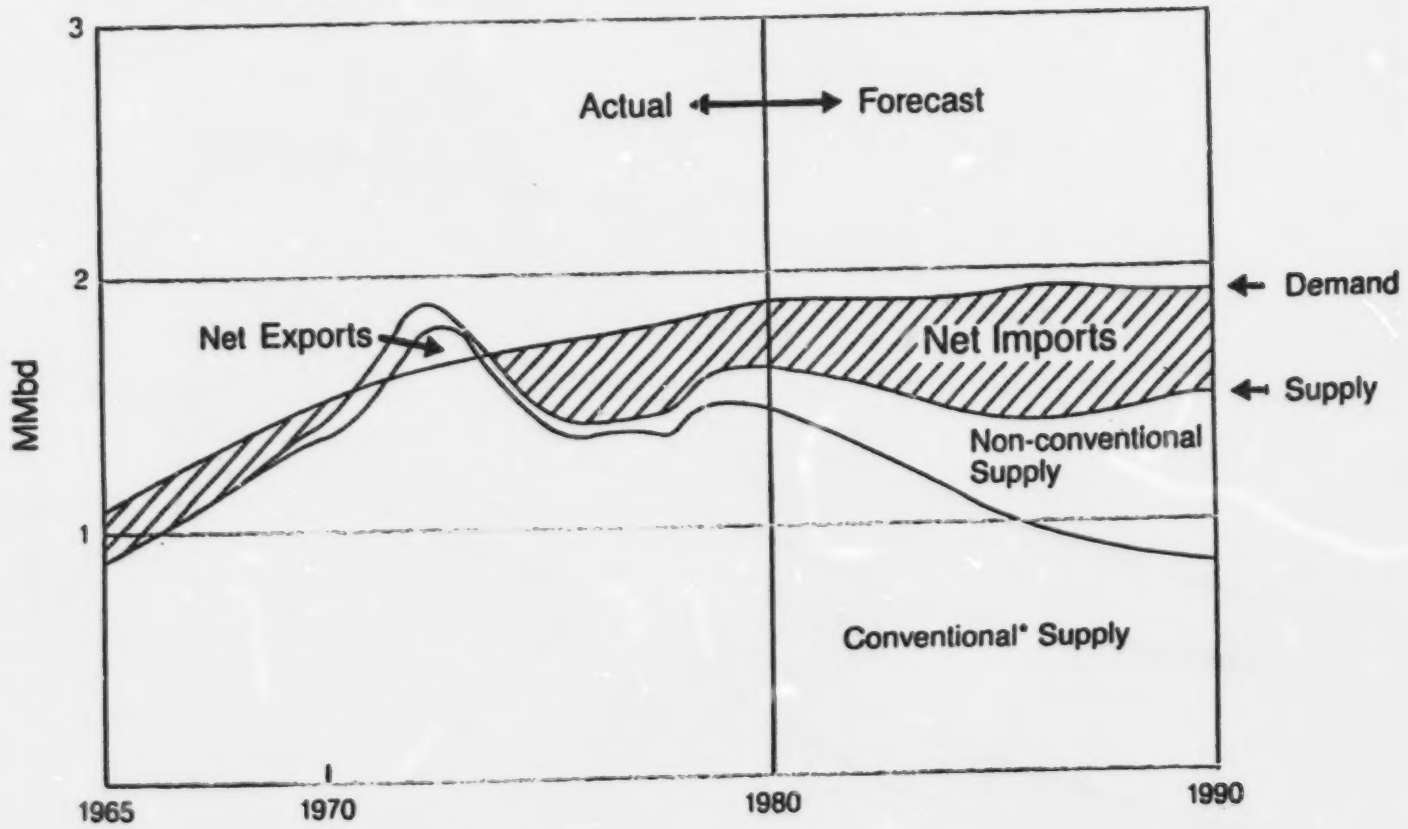
It should be noted that the North American automobile manufacturing industry, as a result of the operation of the Autopact, has specialized its production. Canadian plants no longer produce a wide range of models to satisfy Canadian demand. Specialization of automobile manufacturing on both sides of the U.S.-Canada border has resulted in significant two way trade. For instance, about 70 percent of all automobiles made in Canada are exported to the United States and about 50 percent of all cars purchased by Canadians are made in the U.S. This trade has important implications for Canadian fuel economy standards - it is clear that they must be broadly compatible with the U.S.standards, so as not to require significant differences in technology. Some latitude is possible by potentially different sales mix of cars in Canada vis-à-vis the United States. Another latitude is provided by emission standards in Canada being less severe than in the U.S. since 1975. Some manufacturers have chosen to modify their large sales volume cars, to give better fuel consumption in Canada while still meeting emission standards. The actual improvements in fuel consumption vis-à-vis U.S. cars have on average been small - about 3% - and part of this difference can be accounted for by less demand for energy consuming options in Canada, such as air conditioning.

One area which has been receiving wide attention in Canada recently is the gap between laboratory rated fuel consumption and that obtained by consumers on the road. Obviously if this gap widens in the 1980's the expected savings from fuel consumption standards will be reduced, and the public credibility of manufacturers' claims of improvement will suffer. The reasons for the gap between laboratory tests and on road fuel consumption are fairly well known - methods of reducing the gap are not easily at hand however. If we put aside the differences

in duty cycle, one of the main explanatory factors for the gap is the cold operating temperatures faced by Canadian and Northern U.S. motorists for half the year. It is well known that certain technologies, especially diesels, do not suffer much fuel consumption degradation in cold weather, but there are limits to the proportion of diesel motor vehicles which can be supported by the Canadian refining industry. For gasoline vehicles, research is underway in cooperation with a major vehicle manufacturer, to evaluate various hardware options for improving cold weather fuel consumption. This work has already met with some success.

In summary, fuel consumption policy has become an integral part of Canadian energy policy. The direction this policy will take over the next few years seems to be in the direction of an extremely close relationship to alternative fuel policy, as Canada is one of the few countries in the world which has some opportunity to displace conventional petroleum fuels in transportation in this decade.

Canadian Oil Supply and Demand: Continuation of Current Policy



*Includes enhanced recovery and pentanes plus.

Figure 1

CANADA, CONSUMPTION OF PETROLEUM PRODUCTS BY SECTOR 1960 TO 1977

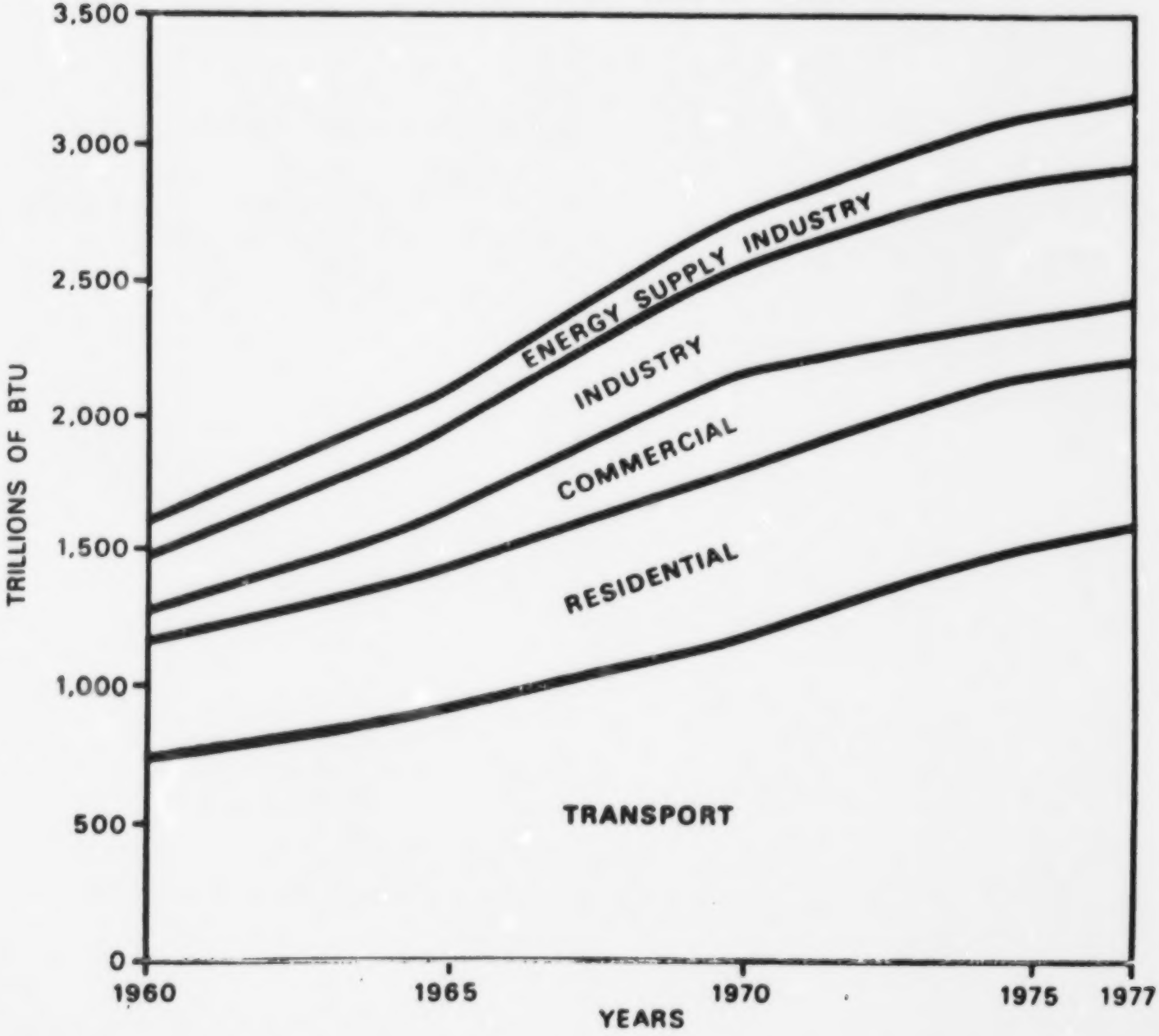


Figure 2

Figure 3

1979

ENERGY CONSUMPTION WITHIN THE TRANSPORTATION SECTOR

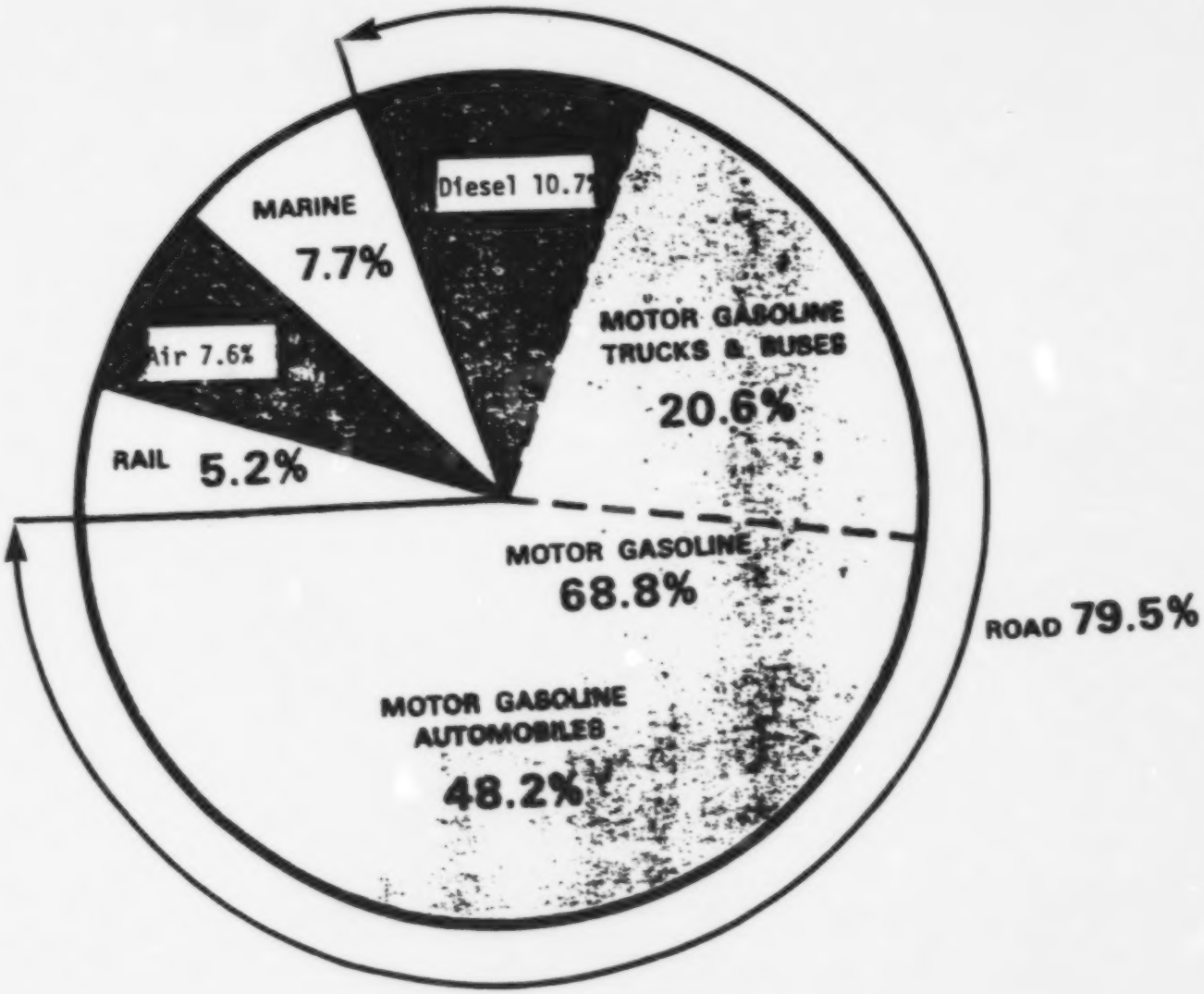


Figure 4

Transport Canada | Transports Canada

Road Safety | Sécurité routière

Fuel Consumption GUIDE 1981 Consommation de carburant

Edition - 1 Oct.1980

Figure 5

SECTION 1

Automobiles listed alphabetically by manufacturer.
Par fabricant, liste alphabétique des automobiles.

1

AUTOMOBILES...

MANUFACTURER'S CAR LINE / FABRICANT MODÈLE	ENGINE SIZE / CYLINDRÉE DU MOTEUR	CYLINDERS / CYLINDRES	TRANSMISSION / BOÎTE DE VITESSES	CARBURETOR / CARBURATEUR	FUEL / CARBURANT	FUEL CONSUMPTION L/(100 km) / CONSOMMATION DE CARBURANT: URBAN / URBAINE	HIGHWAY / ROUTIÈRE	RATING / COTE
* AMC								
CONCORD	2.5	4	A3	2	X	12.9	9.2	10.6
CONCORD	2.5	4	M4	2	X	11.3	7.8	8.8
CONCORD	4.2	6	M4	2	X	13.9	8.3	10.7
CONCORD	4.2	6	A3	2	X	13.7	8.9	10.9
CONCORD WAGON	2.5	4	A3	2	X	12.9	9.2	10.6
CONCORD WAGON	2.5	4	M4	2	X	11.3	7.8	8.8
CONCORD WAGON	4.2	6	A3	2	X	13.7	8.9	10.9
CONCORD WAGON	4.2	6	M4	2	X	13.9	8.3	10.7
SPIRIT	2.5	4	A3	2	X	12.9	9.2	10.6
SPIRIT	2.5	4	M4	2	X	11.4	7.8	8.9
SPIRIT	4.2	6	M4	2	X	13.6	8.3	10.5
SPIRIT	4.2	6	A3	2	X	13.1	9.1	10.7
* AUDI								
4000	2.2	5	M5	R	B			
4000	2.2	5	A3	R	B	12.6	7.5	9.2
5000	2.2	5	M5	R	B			
5000	2.2	5	A3	R	B	14.0	8.1	11.1
5000 TURBO	2.2	5	A3	R	B			
* BUICK								
CENTURY	3.8	6	A3	2	X	12.6	7.7	9.8
CENTURY	4.4	8	A3	2	X	13.4	8.3	10.4
CENTURY FFS	4.3	8	A3	2	X	13.9	8.4	10.7
CENTURY WAGON	3.8	6	A3	2	X	12.6	7.7	9.8
CENTURY WAGON	4.4	8	A3	2	X	13.8	8.7	10.9
CENTURY WAGON	5.0	8	A3	4	X	14.4	8.5	11.0
CENTURY WAGON FFS	4.3	8	A3	2	X	14.6	8.7	11.2
CENTURY WAGON FFS	4.9	8	A3	4	X	16.0	10.0	12.8
ELECTRA	5.0	8	A4	4	X	15.0	8.4	11.3
ELECTRA	5.7	8	A3	4	X	16.3	10.4	13.2
ELECTRA DIESEL	5.7	8	A3	R	D	12.5	7.3	9.6
ELECTRA FFS	4.1	8	A4	4	X	14.6	8.1	10.8
ELECTRA FFS	5.0	8	A4	4	X	15.0	9.1	12.1
ESTATE WAGON	5.0	8	A3	4	X	15.0	8.4	10.2
ESTATE WAGON DIESEL	5.7	8	A3	R	D	12.5	7.2	9.6
ESTATE WAGON FFS	5.0	8	A4	4	X	16.1	9.1	12.1
LE SABRE	3.8	6	A3	2	X	13.0	7.7	9.9
LE SABRE	4.4	8	A3	2	X	13.8	8.7	10.9
LE SABRE	5.0	8	A3	4	X	14.9	9.1	11.6
LE SABRE DIESEL	5.7	8	A3	R	D	12.4	7.2	9.4
LE SABRE FFS	4.1	8	A3	4	X	14.6	9.6	11.6
LE SABRE FFS	4.1	8	A4	4	X	14.6	8.1	10.8
LE SABRE FFS	5.0	8	A3	4	X	15.0	10.1	12.5
LE SABRE FFS	5.0	8	A4	4	X	15.2	8.4	11.4
REGAL	3.8	6	A3	2	X	12.6	7.7	9.8

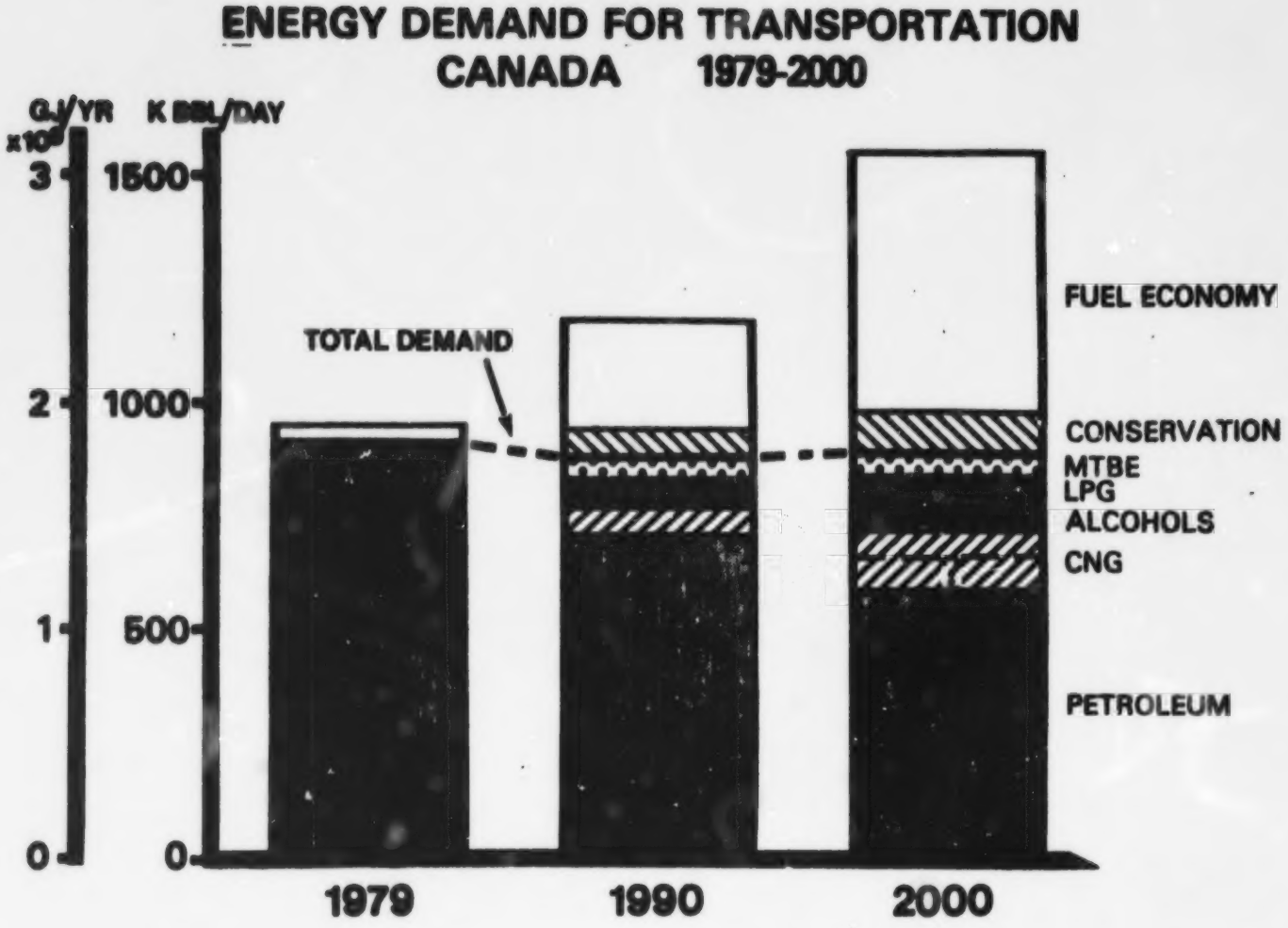

ENERGY DEMAND FOR TRANSPORTATION
CANADA 1979-2000
G.J/YR
x10⁹
K BBL/DAY
3
2
1
0
1500
1000
500
0
TOTAL DEMAND
FUEL ECONOMY
CONSERVATION
MTBE
LPG
ALCOHOLS
CNG
PETROLEUM
1979
1990
2000

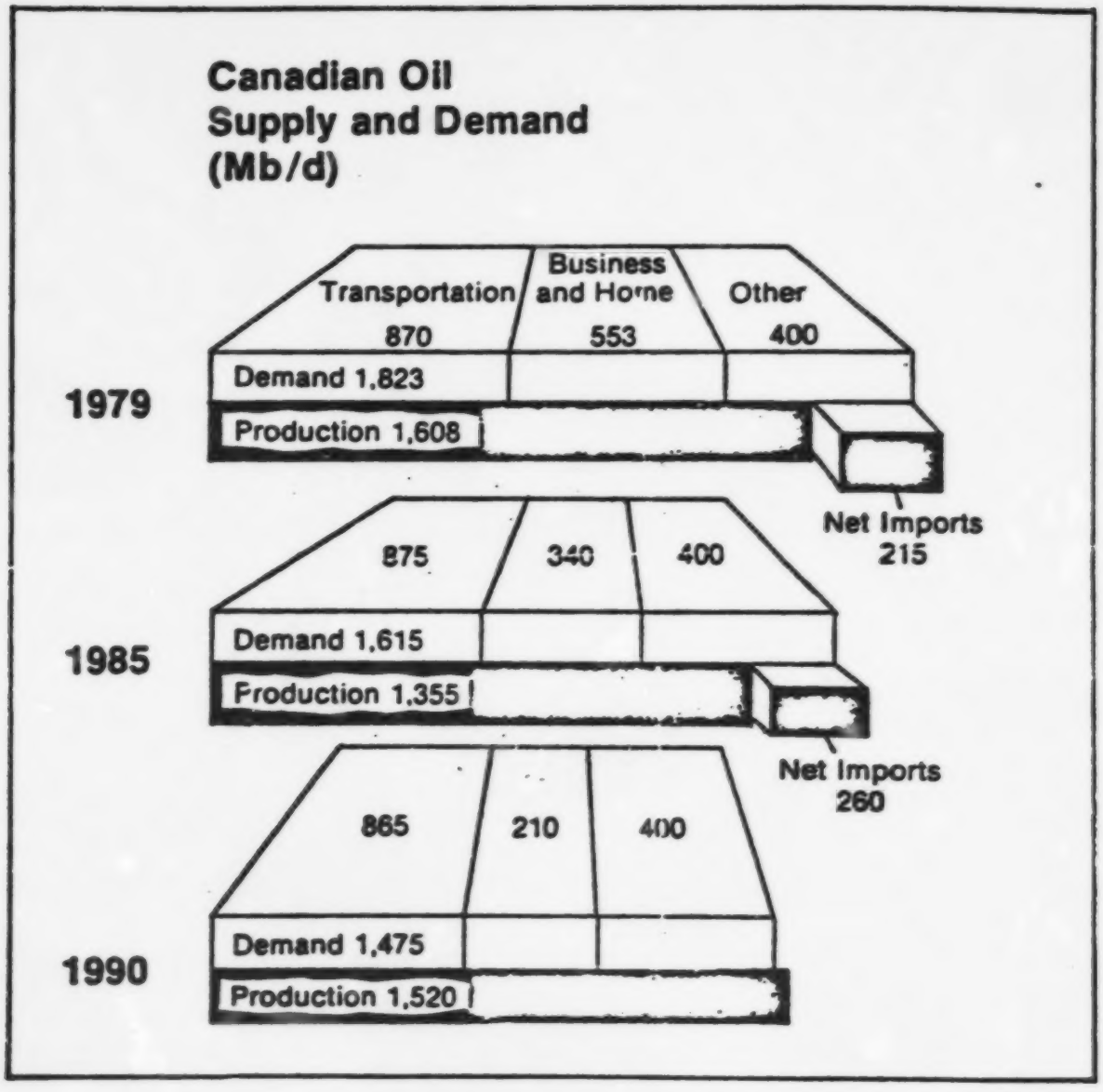
Figure 6

FLEET AVERAGE FUEL
CONSUMPTION OBJECTIVES (L/100KM)

1980	11.8
1981	10.7
1982	9.8
1983	9.0
1984	8.7
1985	8.6

Figure 7

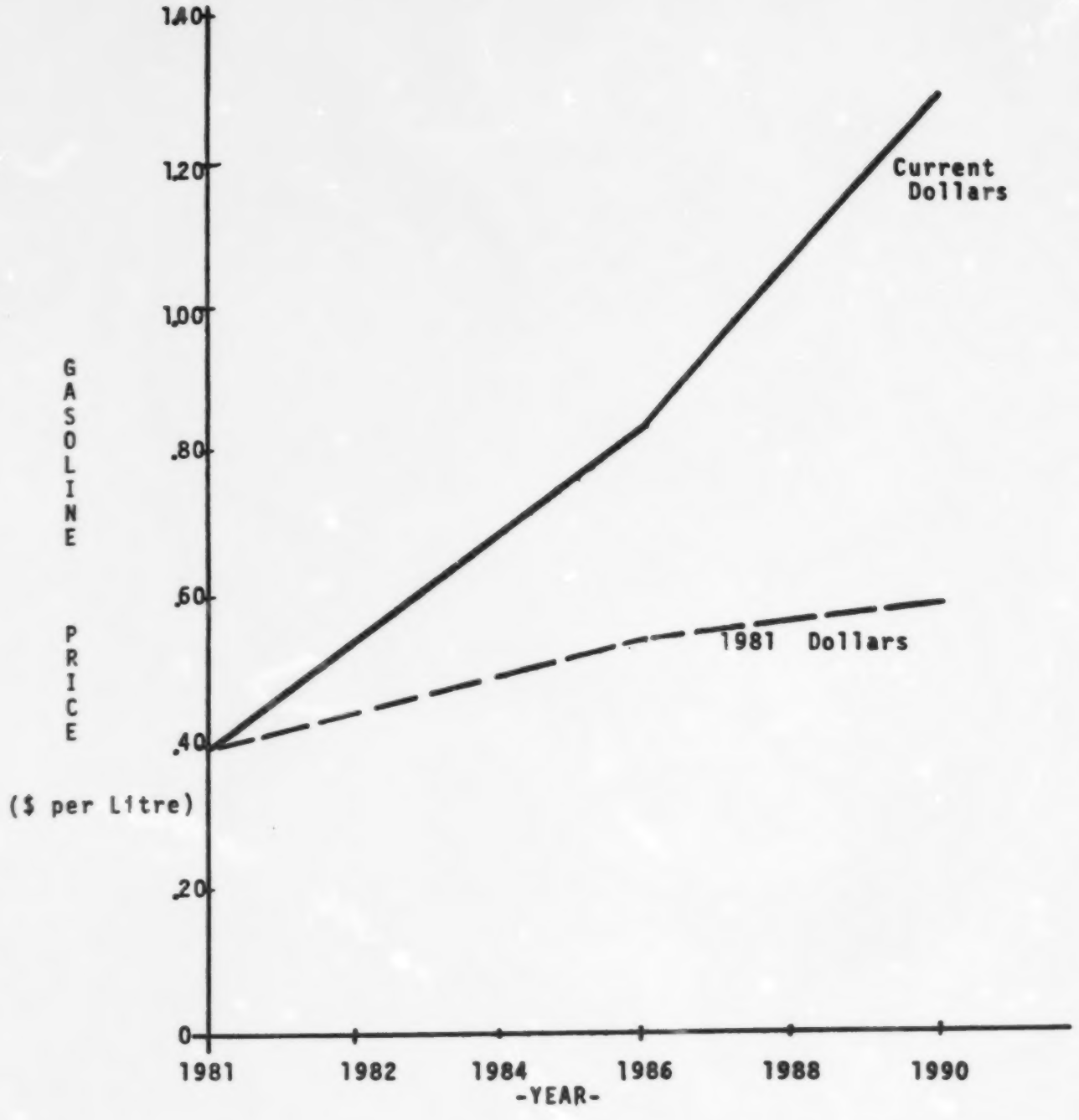
Figure 8



CANADIAN NATIONAL ENERGY PROGRAM

Figure 9

CANADA, FORECAST OF GASOLINE RETAIL PRICE 1981-90



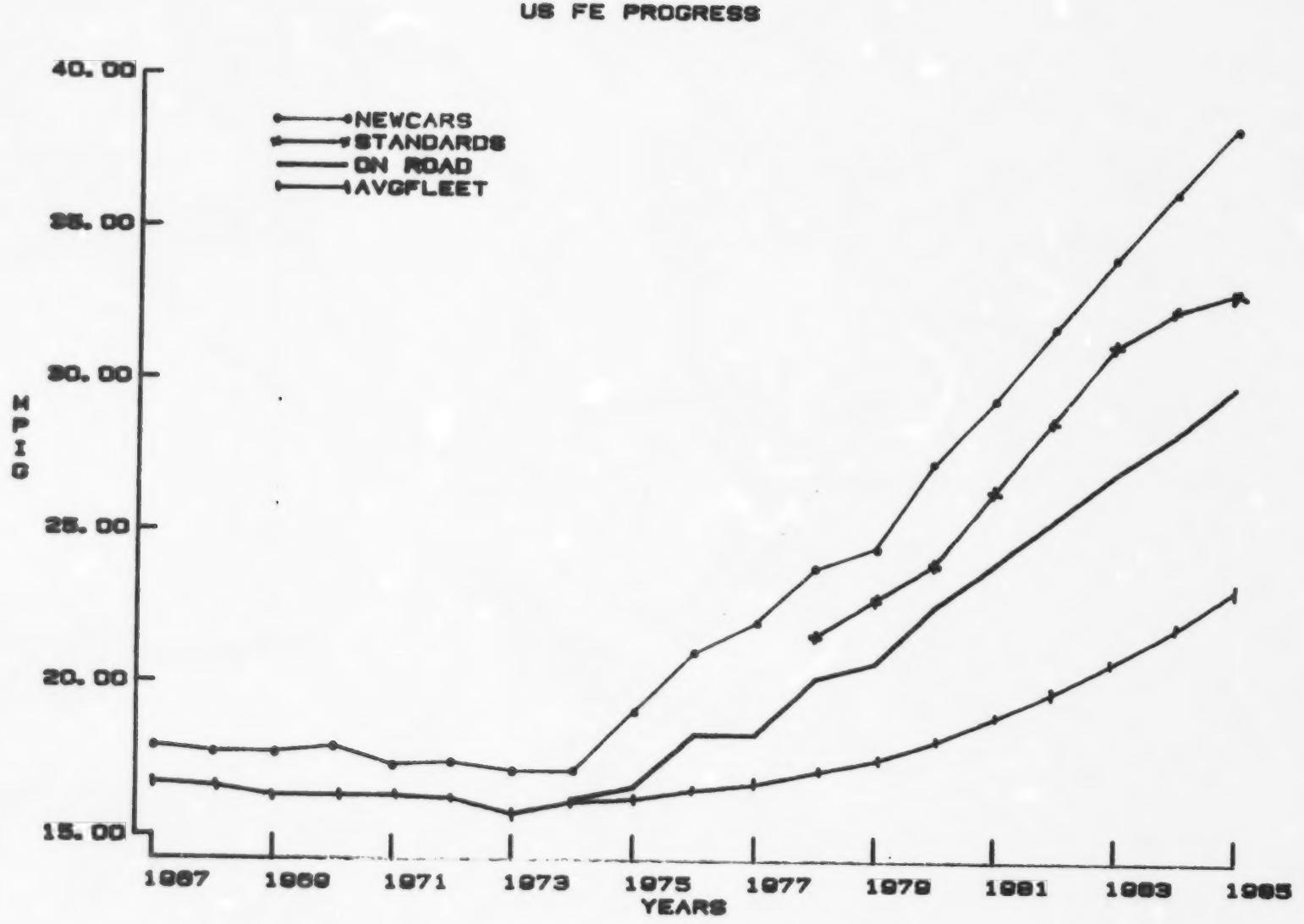

US FE PROGRESS
NEWCARS
STANDARDS
ON ROAD
AVGFLEET
MPG
40.00
35.00
30.00
25.00
20.00
15.00
1967
1969
1971
1973
1975
1977
1979
1981
1983
1985
YEARS

Figure 10

CANADA/US NEWCAR INDUSTRY AVERAGE FUEL CONSUMPTION

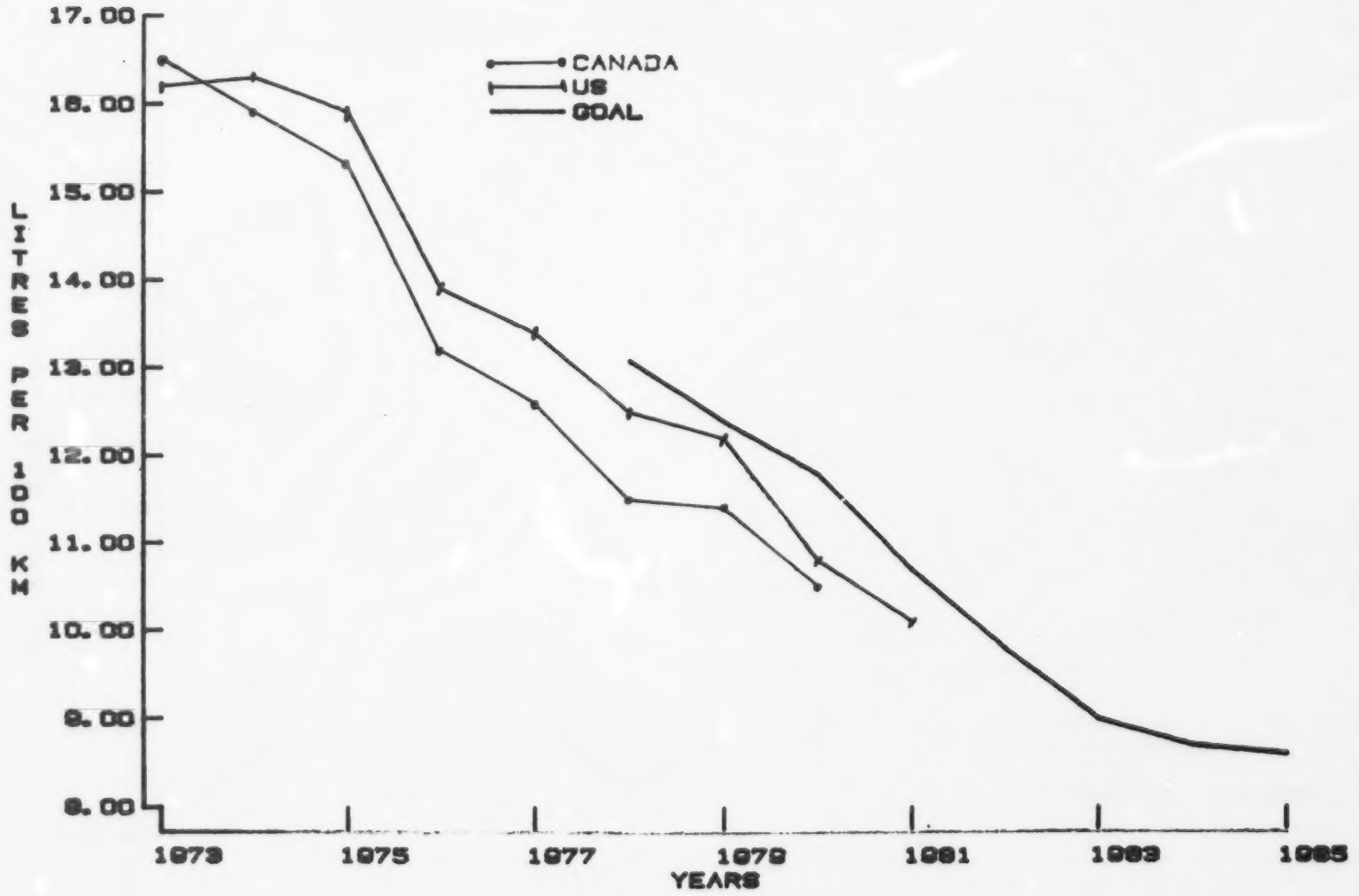


Figure 11

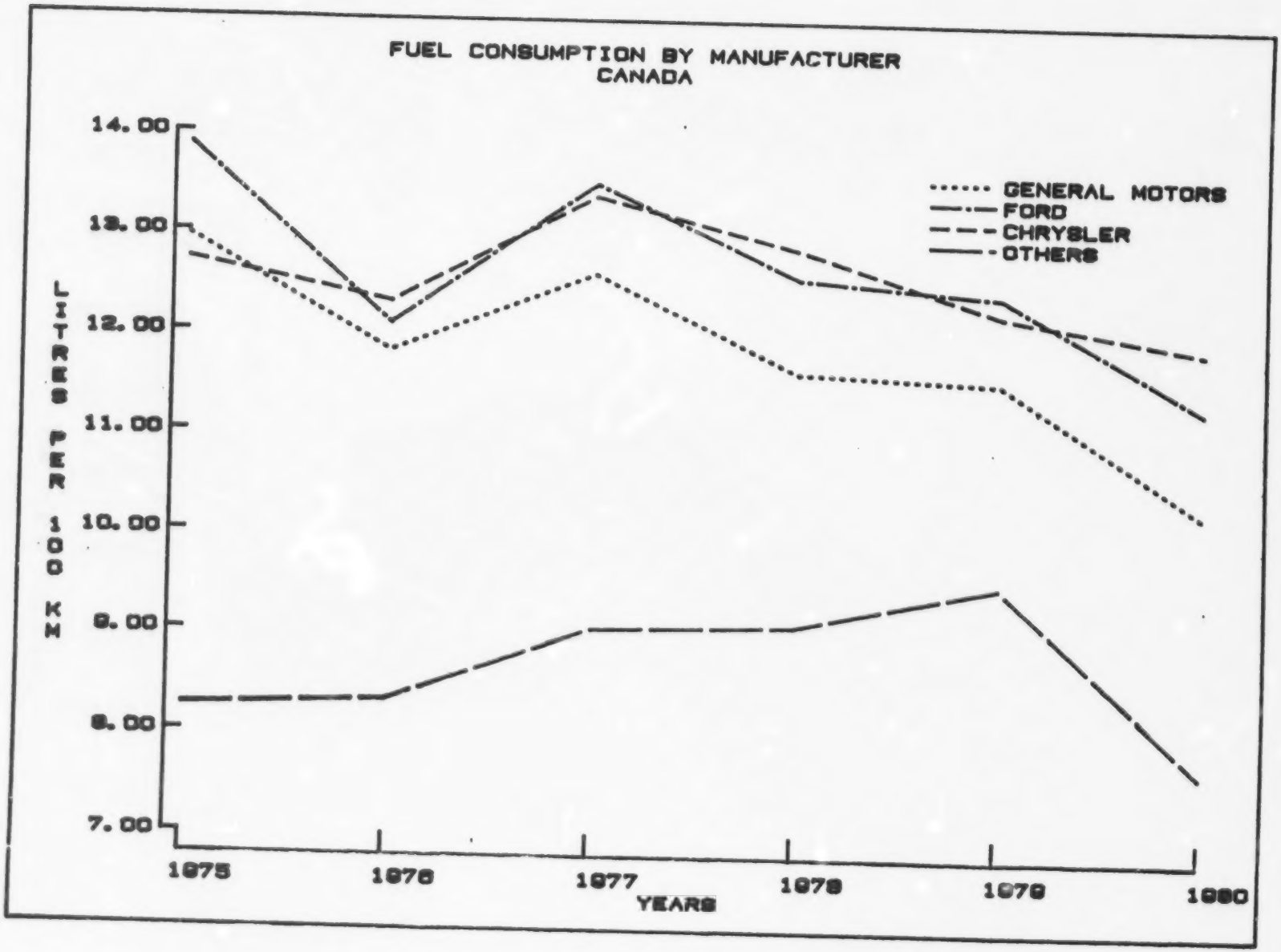

FUEL CONSUMPTION BY MANUFACTURER
CANADA
14.00
13.00
12.00
11.00
10.00
9.00
8.00
7.00
LITRES PER 100 KM
GENERAL MOTORS
FORD
CHRYSLER
OTHERS
1975
1976
1977
1978
1979
1980
YEARS

Figure 12

CANADA, TRENDS IN SALESWEIGHTED INTERIOR VOLUME FOR NEW AUTOMOBILES 1975-1980

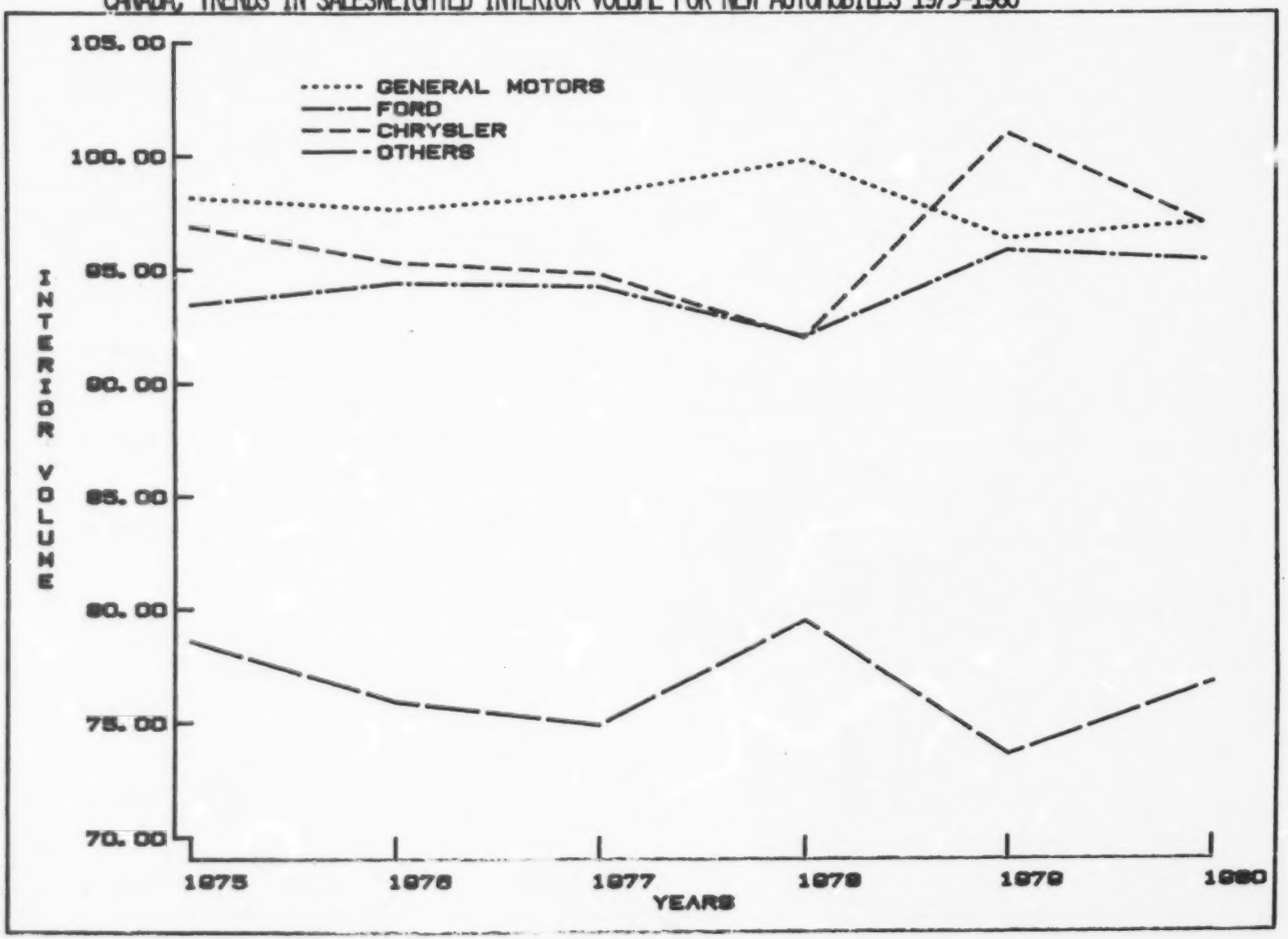


Figure 13

CANADA, TRENDS IN SALESWEIGHTED INERTIA WEIGHT FOR NEW AUTOMOBILES, 1975-80

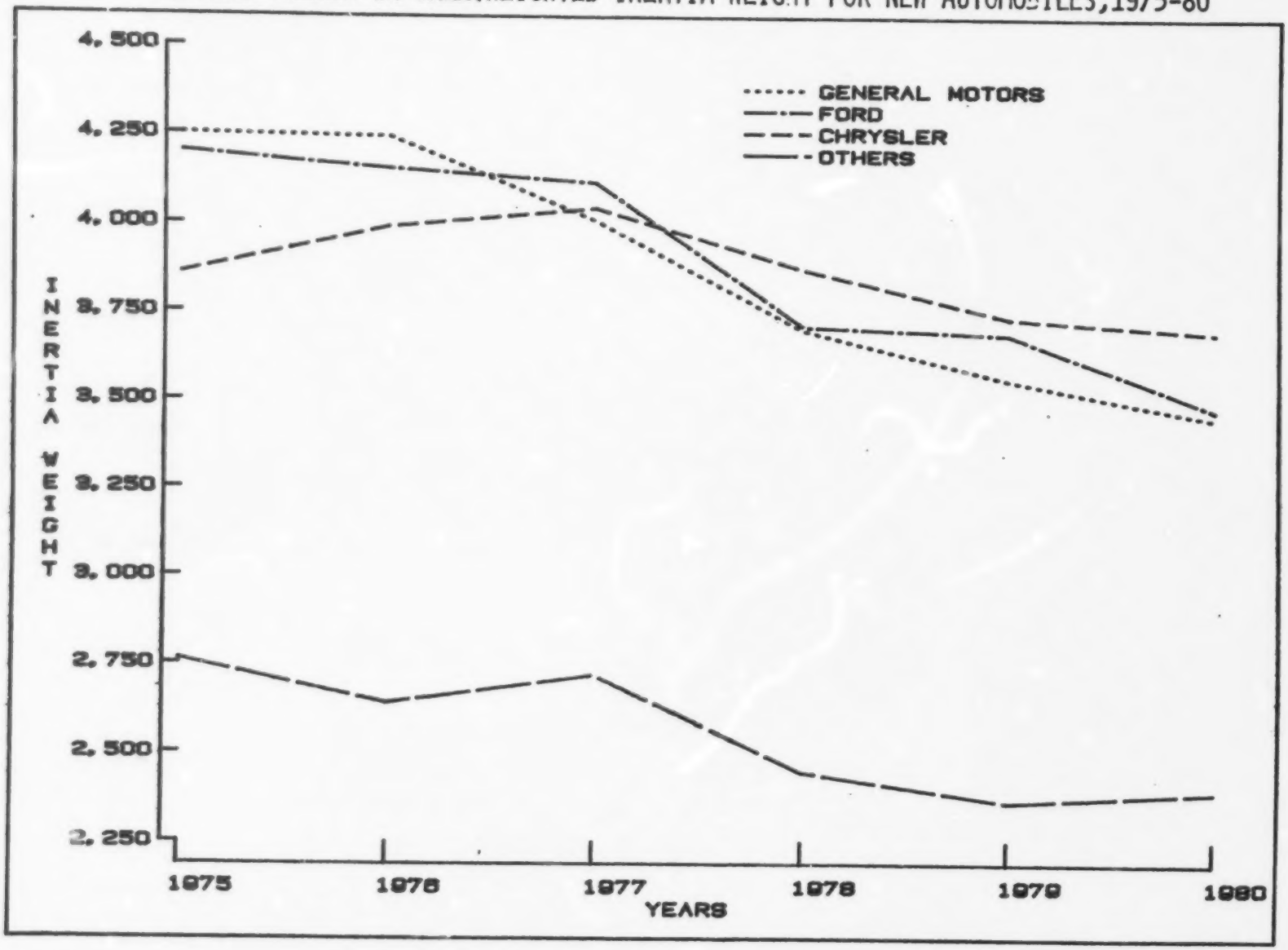


Figure 14

CANADA, TRENDS IN SALESWEIGHTED ENGINE DISPLACEMENT, 1975-80

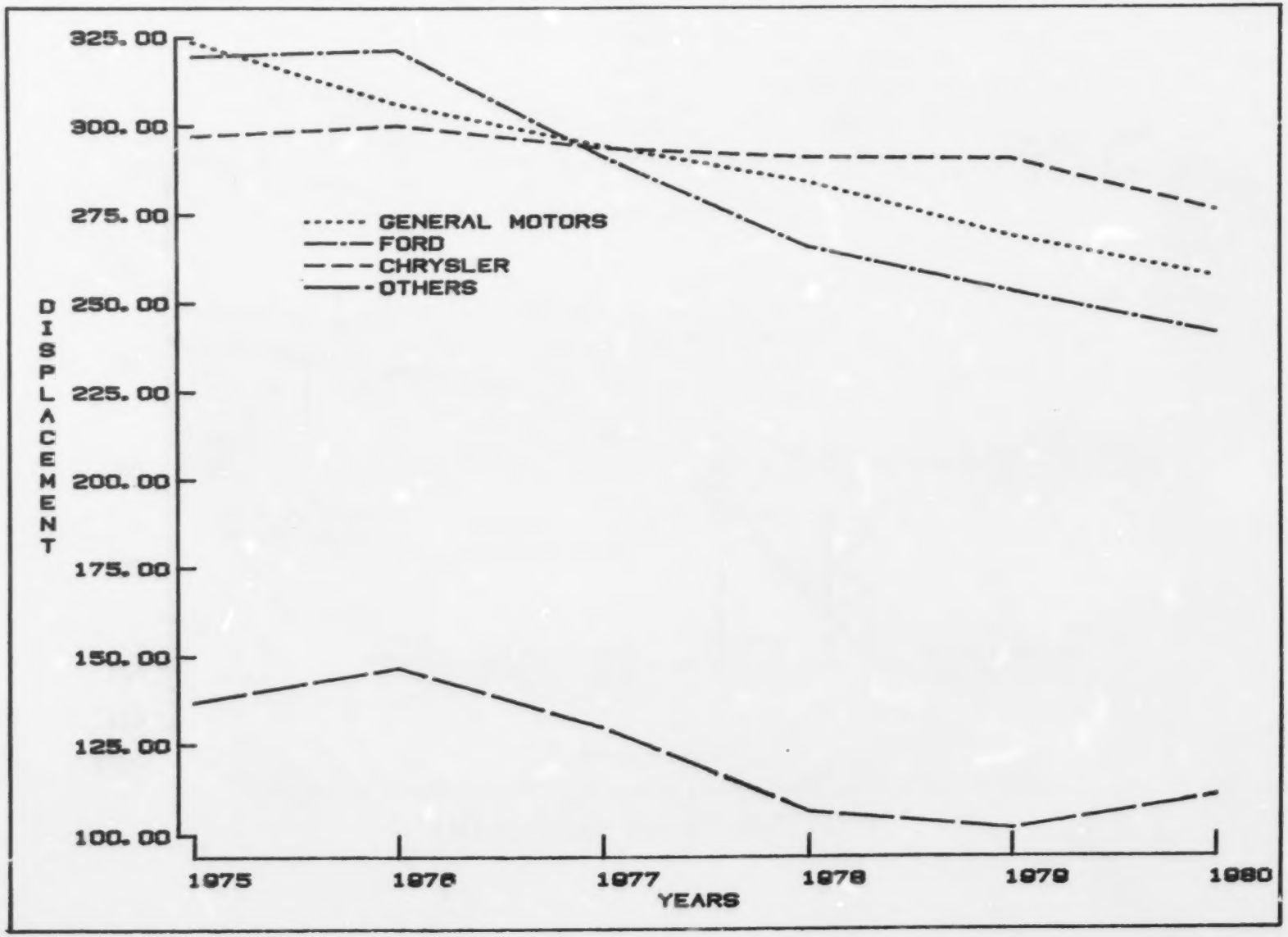


Figure 15

LIQUID FUEL OPTIONS FOR 1990

COST PER BARREL OF PRODUCT (NET OR PROVINCIAL ROAD TAXES)
(1980 DOLLARS)

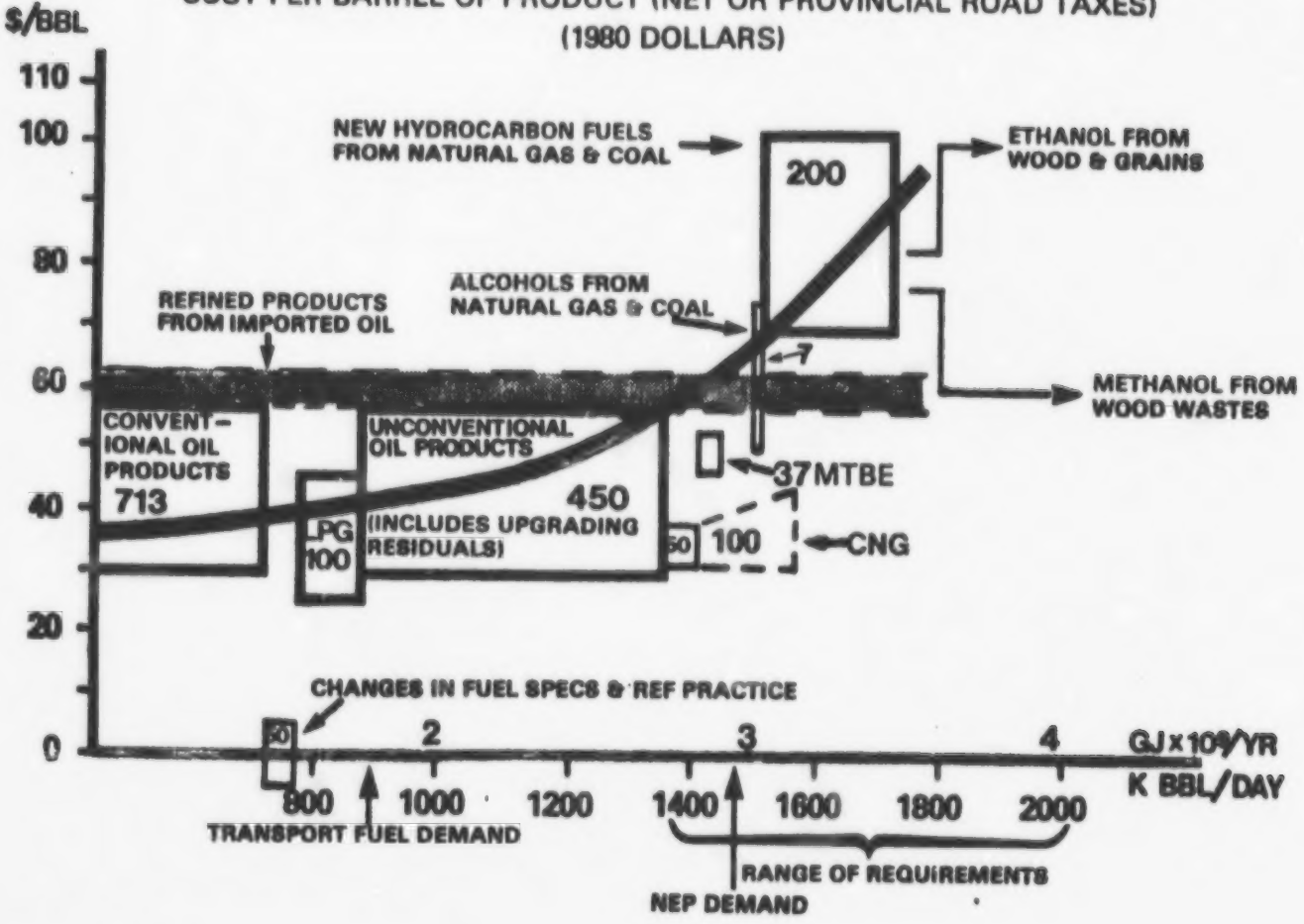


Figure 16

WHERE SHOULD WE BE GOING IN CONSERVATION?

Notes for a talk by:

David B. Brooks

Coordinator of the Ottawa
Office of Energy Probe and
President of Friends of the Earth Canada

At the seminar:

Energy Conservation - Retrospect and Prospect

Ottawa, 2 December 1981

WHERE SHOULD WE BE GOING IN CONSERVATION?

The theme of the presentation is as follows:

1. You've come a long way, baby.

2. But you've got a lot further to go.

Or, to use the good news/bad news metaphor: The good news is that energy conservation is working; the bad news is that the next steps will be harder.

I. How Far We Have Come?

1. Consider the changing orientation of Federal energy policy documents: from satisfying all reasonable demands in 1973, to a more balanced supply/demand approach in 1976, to the first attempts to put demand first (which is where it belongs) in 1980.

2. Consider the projected rates of growth for energy demand in the same Federal documents -- dropping from about 5%/annum in 1973 to 3.7% in 1976 to (an implicit) 1.9% in 1980. You can extend these results if you wish by playing a game we did at an NEB hearing: if you maintain the same rate of decline (-14%/annum), you reach the conclusion that EMR will be projecting zero energy growth in the mid-1980s and, reductio ad absurdum, zero energy consumption by about 1995.

3. Actual statistics on energy consumption in Canada have been encouraging no matter how viewed and no matter how adjusted for the current recession. Energy use is falling even in those sectors, such as automobile use, that were formerly most resistant to conservation. We may have rejoiced too quickly at the record in 1975, when Canada experienced a one-year-long period of zero energy growth, but we now seem to be approaching that situation in reality.

4. Finally, however viewed, some attention has to be given to the fact that in the summer of 1973 the idea to create an Office of Energy Conservation was rejected by the Federal Cabinet. That decision was of course reconsidered a few months later, and the office grew to a dozen or so in two years and now has more than 100 staff people. Some of that may be evidence of failure rather than success, as I will mention below, but it cannot be ignored. Less well known is the fact that as late as 1975, a proposal prepared by Brian Kelly and myself to create within EMR an Office of Renewable Energy Resources was also rejected, yet now it has become an important part of the Department's mandate.

II. How Much Further Can We Go?

No matter whether one takes the verb "can" as referring to technical, economic or social opportunities, the answer is unequivocally: A Very Long Way. Analytic studies, and I want to emphasize the word "analytic", going under the name of soft energy paths, have demonstrated in every developed country where they have been undertaken that zero energy growth is in fact quite easy. We should actually be aiming for modest annual declines in our use of energy. Moreover, while specific results are different, the same general approach applied to developing countries shows that their energy demands, while increasing to support industrialization, need not grow nearly so much as once thought.

The results of these studies are so compelling that those of us involved in them almost fear that we are over-proving the case, that we risk losing credibility because of the strength of the conclusion that increasing energy supply is not essential to (and may even be in conflict with) social and economic well-being. The key to this reversal of what was almost the received wisdom a decade back lies in several analytic concepts:

1. Energy cannot be analyzed adequately if you start with supply. You have to start with demand, and even go behind demand to ask what services energy is providing.

2. At each stage of production, including end-use devices and all levels of conversion and transportation, the opportunities for improved economic and technical efficiency must be sought out and applied. It is almost always far easier to resolve supply/demand balance problems from the demand than from the supply side. For instance: in the case of aluminum it is easier (cheaper) to recycle than to find more electricity for primary production; in the case of housing it is easier (cheaper) to retrofit than to supply ever more expensive electricity or fossil fuels.

3. When you finally reach the stage of identifying possible sources of energy, technical and economic efficiency suggest that those energy sources should match the end uses for which they are destined in scale (quantity) and form (quality) as closely as possible. Matching in scale reduces transportation losses and matching in form reduces transformation losses, both of which are among the largest and most risky aspects of today's energy systems.

4. And do not try to find panaceas, for in that route is both environmental destruction and economic madness. The key to an efficient, environmentally sound and fail-safe (or, better, safe-fail) system lies in the use of a multitude of small, carefully selected components.

The results of soft path studies, which are generally presented in terms of the thermodynamic qualities of the energy required, show, among other things, that:

1. The provision of low and medium temperature heat (say, up to 200°C) is easy and essentially any region -- probably any neighborhood -- could become self-sufficient in time.

2. When electricity is used for those things it does best, such as lighting and electronics and making motors turn, there is already enough capacity in our system for all projected needs.

3. The major consumers of energy in the future will be the industrial sectors and, secondarily, commercial transportation. These are the sectors that have the most specific and least substitutable demands for energy.

4. There are enormous opportunities for "closing the circle" and using what is today "waste heat" or "waste products" as energy sources. Essentially all low-temperature heat requirements could be provided from such sources.

5. The range of potential sources of energy, mainly from solar sources (broadly interpreted to include biomass, wind, etc.), is much greater than generally acknowledged. And, of greater importance, when these sources are compared at the margin with the delivered costs of conventional fossil fuels or electricity, they either are now or show great promise of becoming cost competitive for most if not all end uses.

When the results for greater energy efficiency are combined with those for the development of alternative energy sources, soft energy studies show that there are only a couple of serious problems:

1. The most important problem is finding a portable, fluid fuel to use in transportation. The demand for transportation services is going to remain high, and while opportunities to satisfy that demand are not lacking, it is far from clear which of the several possible routes to follow in satisfying that demand. There are alternative levels and patterns of demand into which must be meshed potential sources as different as Arctic oil and Nova Scotia milkweed and fuels as different as natural gas, alcohol and hydrogen.

2. A serious but much smaller problem lies with identifying sources for the small quantity of industrial energy required at high temperatures, as a liquid or in the form of electricity.

3. A transitional problem exists with those areas (only the Maritimes in Canada) that are now heavily dependent on oil-generated electricity.

4. And, the only problem that is unique to soft path approaches, how are we to provide back-up or residual demands for energy in those end uses that will require very little outside supply because of extensive conservation or in those sources that are subject to great seasonal variation. In principle you could impose impossible peak loads on a central utility.

III. How Are We Going to Get There? What is Needed?

Unfortunately, this is the hardest part -- for everyone: bureaucrats, industry, politicians and environmentalists. The key action that is needed now is IMPLEMENTATION. We do not need a lot more studies and we do not need a lot more R & D. We simply need to go out and DO CONSERVATION. Very few people object any longer to conservation per se; it is only when you make a specific proposal that you get objections. For then some ox is gored, someone loses out, there are different winners and losers than there would have been in the absence of conservation. Even pure public information programs -- and I am not talking about advertising, but about energy efficiency data -- run afoul of such problems. Witness the slow start of Energuide and the awkward placement of the labels.

You should anticipate such opposition, and be prepared for it. My own experience suggests that the main opposition will come from entrenched bureaucracies, whether they be federal, provincial or corporate. Their objections are, as often as not, going to try to create a Catch-22 situation so that conservation measures can't win no matter what. I have sorted out these objections into four types:

Catch 22 # 1: The energy saving is either too small to bother about or so big as to be disruptive.

Catch 22 # 2: The energy saving either depends upon voluntary compliance, which doesn't work, or on mandatory rules, which are unacceptable in a democratic society.

Catch 22 # 3: The energy saving will either be cost effective, in which case it will happen anyway so don't worry about it, or it will not be cost effective in which case you shouldn't be messing with it.

Catch 22 # 4: It is in someone else's jurisdiction, department, mandate or whatever.

Let us therefore think of those things that will get IMPLEMENTATION on the road, strongly, forcefully and permanently, so that conservation becomes as much a part of our energy future as supply has been of our past.

1. Pricing

Isn't this issue settled? Perhaps it is for oil, and to a considerable degree for natural gas as well. But the issue is far from settled for electricity, which continues to be priced in an outmoded and inefficient way. Electricity must come to be priced at its marginal cost (long run), which is something like 5 or 6¢/kW.h if not more. (And by the way, we have to get both the Federal and provincial governments to stop pretending we use more electricity than we do, a result they promote by the statistical trick of treating hydropower and nuclear power as if it were produced by burning oil.)

As far as other sources go, the counterpart to the pricing issue is the need to develop standards for sources and for end-use equipment. We need to develop the marketing institutions so that the purchase of, say, wood pellets can be as simple as that of oil.

2. Studies

In a few selected technical and economic areas, there is still a high pay-off to additional studies -- but these are more the exception than the rule. On the technical side I would spend most of my money today on alternative fuels for transportation and on alternative ways to move goods. I would spend a little on improved ways to both reduce peak loads (especially seasonal peaks) on central utilities and on ways to integrate locally generated heat and electricity with central supplies needed as back-up. Almost everything else I would leave to industry, which is extraordinarily dynamic when turned on to an issue. The role of government is largely to make sure there is a ready market for conservation innovations.

There is still a high pay-off to economic and social studies to demonstrate (as well as one can in such studies) the impacts of conservation on employment, on inflation, on equity among energy users and on regional development. We have become so convinced of the cost effectiveness of conservation that we have lost sight of the fact that its greatest political appeal may lie in its macro rather than its micro economic aspects, and in its social effects.

These may also be the ways to attract the attention of Transport Canada, of CMHC, of IT & C, etc. to select the Federal bureaucracy as my example. I said earlier on that the growth of the old Office of Energy Conservation into today's CREB was in part the evidence not of success but of failure. What I mean is that that growth came about in part because of EMR's inability to convince other parts of the Federal bureaucracy and provincial bureaucracies to take energy conservation seriously. So CREB had to do it itself. However, it would have been far better had the message spread more widely and forcefully so that implementation was taken up by the operating departments and agencies themselves.

3. Getting On With It

Pricing and studies provide a background but only that. The real work comes in trying out different ideas. We have to know what works where and for whom. One might almost say that, so far as conservation goes, we should stick with Chairman Mao (it is no doubt safe to quote him now that his wisdom is in question in China): Let Many Flowers (i.e., Programs, Measures, Regulations, Incentive Payments, Restrictions, Education, etc.) Bloom! A survey of studies I undertook in preparation for this talk shows lots more information on "What is likely to happen if" than on "What really happened when". We need to DO CONSERVATION and to MONITOR RESULTS. The themes involve at least (1) reward conservers, (2) punish non-conservers and (3) provide information so that conservation becomes the desired way of life. But which works in which sector, and on which agent or actor? Those are empirical questions that can only be answered by trying to do conservation.

4. Lifestyles

Finally, if we are going to move to where we could in conservation, we have to stop pretending that it is all a matter of economic efficiency. Energy conservation is about lifestyle choices as well, and in both the small and the large sense. That is, energy conservation cannot be treated seriously and fully without some attention to what the consumer is buying and how much he/she is buying, nor without equal attention to what industry is producing and how much it is producing. The nature and the scale of our consumption and production choices do matter. Consider that:

1. Even common energy conservation measures exist on a continuum from pure technical fix (add insulation) to pure lifestyle (turn down thermostat);

2. Many conservation measures cannot be clearly placed anywhere on the spectrum (e.g., smaller automobiles, separation of waste by households into metal, glass, paper and garbage);

3. Many issues of critical concern in setting energy policy have little to do with efficiency per se (e.g., centralization vs. decentralization, potential military applications, impact on land use);

4. Determination of economic efficiency is based on a price system that, in the case of energy, is of questionable efficiency in itself (or that, in economics jargon, is characterized more by externality than by optimality);

5. Key energy developments, including conservation on the one hand and nuclear electricity/Beaufort sea oil on the other, will likely be decided only in small part on grounds related to efficiency.

There is a growing body of evidence to suggest that today's disarray in economic, social, energy and environmental policies is no accident; that the conjunction of unemployment, inflation, poverty, pollution and shortage is systematic; and that the cure is not more growth but less growth; or, stated more cautiously, more emphasis on qualitative development and less on quantitative growth. The case against growth is not proven, but neither can it be dismissed out of hand.

In short, I am suggesting that, if we really want to move into the future, the theme of a Conserver Society, which was common when we started the Office of Energy Conservation but which has fallen into dis-use since, be brought forward once again.

- end -

NOTES FOR REMARKS

BY

GREY HAMILTON

VICE-PRESIDENT AND SECRETARY

CANERTECH INC.

TO

ENERGY CONSERVATION - RETROSPECT AND PROSPECT

SEMINAR

OTTAWA

Talk delivered by:
RAYMOND NAKAMURA
CANERTECH INC.

For Release
1400 hours EST
Wednesday, December 2, 1981

INTRODUCTION

I appreciate the opportunity provided by this seminar to say a few words about Canertech Inc., its perspective on energy conservation in Canada, and its interests in the field of energy use management.

First, however, may I congratulate those who designed the seminar for a useful and pertinent agenda and a constructive discussion paper.

The paper addresses energy conservation as a "supply" resource. This is the approach that Canertech has taken in interpreting its mandate and assessing its priorities.

Recognizing conservation as a source of energy "supply" is a significant intellectual step in according it the importance it deserves. Energy conservation is and must be a cornerstone of our national energy policy.

CANERTECH'S PROFILE

Canertech is Canada's energy technology investment company. Hence, the acronym. We were created by the Government of Canada just under a year ago. At present we are a wholly-owned subsidiary of Petro-Canada. It is the intention to establish Canertech in due course as an autonomous Crown Corporation.

Canertech's mandate derives from the National Energy Program's goals of self-sufficiency and oil substitution. We are empowered by executive order to invest, by way of equity or joint venture, in energy conservation technology and in renewable energy sources and conversion processes.

I intend today to concentrate on the conservation side of our mandate. The priority we attach to it reflects our evaluation of the relative significance of conservation and renewable alternatives. In terms of potential impact on the energy economy by the year 2000, conservation will "supply" many hundreds of millions of Barrels of Oil Equivalent (BOE) - renewable energy, perhaps a few scores of millions.

Canertech is a venture capital development company. It is not a source of debt financing or grants. In placing money at risk, it expects to incur front-end outlays, encounter development horizons and face pay-outs that would not be acceptable to conventional financial institutions. Nonetheless, Canertech must become financially self-sustaining over a reasonable period of time.

Canertech seeks positions in enterprises with lead technology in indicated markets. It offers technical, management and marketing assistance where it is involved. It can participate in demonstration and product development. Canertech endeavours to be synergistic in development of the emerging energy conservation industry; to be active in technology transfer and bringing together human resources and diverse financial interests.

Canertech may itself directly produce, distribute and market conservation services, systems and products

We are initially capitalized by the Government of Canada at 20 million dollars. As we implement our investment strategy, we fully expect to be able to augment substantially our own equity base and our ability to do business.

We are headquartered in Winnipeg and have an Ottawa office. We are professionally staffed in three divisions: technical evaluation, production and marketing assessment, and finance. However, our staff is not, nor will it be, large. We wish to stay lean in order to have a fast response time to proposals and investment opportunities and to make expeditious decisions.

Our specific investment objective in each case is successful commercialization of the service, technology or product. We expect an enterprise in which we are going to take a position to be, or become, financially viable. At the same time, Canertech requires a reasonable

return on its investment.

We will consider any proposal from an existing or prospective business. We look for patentable, proprietary or lead technology, new and innovative services and systems, indicated or prospective markets, entrepreneurial enthusiasm and management commitment. There are no fixed investment criteria, no rigid rules regarding control, no set dollar limitations, no restrictions in the choice of financial instruments. The approach to investment opportunities is individual and flexible.

Canertech focuses on business ability, market position, growth prospects, profits and rate of return commensurate with its perceived risk. In its analysis it also examines potential off-oil benefits as well as technological and market linkages.

Canertech requires submission of a business plan, historical and projected financial statements, and details of capital structure for its investment review. It also needs information about the enterprise under the headings: history, management, technology, manufacturing, marketing, pricing and profit.

THE CONSERVATION ENVIRONMENT

a) Economics

In Canertech's view current and mid-term market economics substantiate the opportunity for rapid and profitable commercialization of many conservation services, technologies and products. The impediments to realization relate mainly to structural, financial, institutional and information problems. In its business strategy, Canertech is seeking ways to help overcome non-market barriers.

b) Policy Setting

Previous speakers have outlined the potential for energy conservation in Canada, the public policy framework and the programs relating thereto. I will not rework this ground except to say that the priority

accorded conservation, the policies and programs in place, provide significant stimulus to development of the energy conservation industry in Canada. They also represent important positive factors for investment.

Canertech believes, however, that there could be a further mix of tax, expenditure, and regulatory measures and new institutional arrangements which would accelerate the development timetable for energy conservation. In our view, the direction of subvention and spending should be towards incentives in the marketplace to foster more rapid use of conservation services and products.

c) Market Influences

Conservation is primarily price and cost motivated. Conservation needs can be met both by changes in behaviour or by conservation services and technologies. In the present and foreseen economic environment, the "technological fix" (because it requires no alteration in lifestyle) is increasingly attractive and creates demand for goods and services which are or can be produced in Canada.

The energy conservation industry can expect unprecedented growth in the Eighties. The new Federal-Provincial Energy Pricing Agreements will accelerate the demand for conservation services and products.

The energy conservation market in Canada is being spurred not only by conventional energy price movements but also by Federal programs such as CHIP, COSP, SEE, the Atlantic retrofit program, and by initiatives at the provincial and municipal levels. Consideration is being given to the extension of the CHIP program to rental/leased buildings.

Canertech believes that serious study should be given to consumer subsidization for the purchase of energy audit services, to promulgation of standards therefor and to the training, certification and registration of contractors providing these services.

One of the most powerful market forces which will emerge to induce conservation and energy efficient construction in the residential market, will be the adoption by mortgage lenders of PITE qualifications (principal, interest, taxes and energy costs) as the measure of income ability to meet carrying costs.

Another incentive is the mandating in the NEP of the "Measures" under the National Housing Act. Energy efficiency standards for buildings - eventually approval labelling - are important in themselves and in terms of market influence, especially if they come to be tied to mortgage loan requirements. CMHC's work on implementing and upgrading the National Building Code Measures is of the highest importance as is provincial co-operation. This work is abetted by the activities of agencies such as NRC's Building Research Division, CSA, CGSB, UL, etc.

Programs such as that of Saskatchewan which offers a $3,000 interest free loan to the purchaser of any new home that meets energy efficient standards are a useful guide to future national policies of financial support. Most provinces have loan programs for residential retrofits (some through utilities).

Gas utilities and major oil companies report declines on the order of 15% for home heating over the last five years. Despite the encouraging trend, the reduction is well below the potential - an indirect indication of market size.

In the commercial sector, it is encouraging that consideration is being given to the introduction of the Building Energy Tax System (BETS), a set of incentives and disincentives to meet energy efficient standards, and to enable owners of lease buildings to share the fruits of capital investment in energy saving measures.

The industrial sector, through 18 federal task forces covering 80% of the sector, has achieved and surpassed its 1976-80 objectives and has

set its sights on higher goals for 1981-85. Similar task forces have recently been established in key institutional/commercial sectors: hospitals, schools, retail stores, office buildings, restaurants. Canertech is in touch with these task forces whose work is pertinent to the initiatives we are taking in the retrofit market to which I shall refer shortly.

We can look forward, next year, to the report of the Federal Government's private sector Task Force on Energy Conservation Technologies. Canertech expects to play a role in the commercialization of energy conservation opportunities identified by the Task Force.

d) Market Size

Comprehensive statistics on the global market in Canada for conservation products and services do not exist. A calculation by EMR of quite limited market segments estimated 1980 sales in the order of one billion dollars. In the U.S., sales of conservation services and goods are expected to reach 50 billion dollars annually in 1990.

Canertech is initiating a comprehensive product-by-product study to identify market size, state-of-the-art, product efficiency, pricing, growth potential, etc.

e) Structural Concerns

Although the opportunities for the conservation industry are large, it is a complex and diffuse sector, comprising mainly small businesses or minor corporate activity.

One of the structural problems is that conservation "supply" has not caught the attention of the traditional energy companies, larger companies which are in a part of the market have not diversified and there are as yet no nationally organized conservation companies.

Energy conservation is only beginning to attract a flow of capital funds from conventional financial sources. Canertech hopes that its presence in the industry will increase the confidence of other private sector investors about the profitable opportunities which exist. Another problem is that though energy prices are shortening payback periods, utility demand charges could shorten them even more. Fourth, products, systems and technologies can be made available to supply the conservation market but the distribution/installation/ servicing infrastructure needs to be developed.

Among the keys to market and industry expansion, and thus to major impact on energy consumption, will be widespread implementation of standards and codes; nationally available audit/assessment/ prescription services; development of reference payback analyses; evolution of reliable infrastructure; and provision of financing mechanisms and mortgage incentives for conservation investments.

CANERTECH'S STRATEGY

In the field of energy conservation, we have to date received nearly 150 inquiries or proposals and we are processing them as rapidly as possible. Canertech is currently in the course of initiating its first few positions. These early investments are in services, systems and products and represent specific elements in the mosaic of business activities in the conservation field which Canertech hopes to promote.

In the mid term - 1985 plus - we expect to be invested in many facets of energy conservation in all parts of Canada; in the long term - 1990 plus - to have fostered establishment of comprehensive services and Canada-wide distribution of products at a profit. We would hope to attract other investors to this field alongside us and, as appropriate, to take public companies in which we are involved.

More specifically, Canertech intends to interest itself in energy

audit services and retrofit packaging for the institutional, commercial and residential market on a national basis, including ways to facilitate financing of conservation measures and the provision of a guarantee of effectiveness.

Secondly, we expect to be a contributor to energy efficient construction and building systems across the country. In the residential sector this will certainly involve low energy housing, incorporating passive solar design. One study made of the potential for passive solar penetration in the Canadian market for single family homes, suggests a cumulative figure for the Eighties of 80,000 houses at the low end; at the high end, more than twice that.

Our direct involvement in these business activities will help to lead and expand the conservation market, improve understanding of product lines, gaps and technology transfer opportunities, and provide the chance to demonstrate new goods and systems.

Through our investment vehicles we hope to satisfy the market's need for availability, convenience, competence, credibility and reliability. We believe these are important factors in the merchandizing of conservation services and products.

Our third strategic focus is on the supply side of the conservation market. We are examining investments in production and distribution of a wide range of technologies and products such as air measurement devices; heat pumps and heat exchangers; improved insulation and building materials and systems; energy management controls; improved combustion and storage systems; energy efficient appliances, and so on. One of the major conservation opportunities lies in measures to improve the efficient production of process heat.

In its investments in conservation, Canertech will be placing its money in existing or new ventures in support of, and as a partner in,

private sector endeavour. Our broad, long-term goal is to foster a strong Canadian industrial base for energy conservation technology.

We can identify potential investment opportunities in conservation on the order of $75 to $100 million over the next five years or so. We believe the industry's capital requirements during this period may be 10 times as great - that is, that it will become a billion dollar growth business!

MARKETING AND FINANCE WORKSHOP
OF THE ENERGY CONSERVATION -
RETROSPECT AND PROSPECT

A PRESENTATION BY

J.-P. CRISTEL
Directeur, Commercialisation
Hydro-Québec

DECEMBRE 2, 1981
SKYLINE HOTEL, OTTAWA

ROLE OF UTILITIES IN MARKETING ENERGY CONSERVATION

BY

J.-P. CRISTEL
DIRECTEUR
COMMERCIALISATION
HYDRO-QUEBEC

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IN THE TIME THAT IS AVAILABLE TO ME, I PROPOSE TO DEAL WITH THE COMMON APPROACH OF CANADIAN UTILITIES TOWARDS ENERGY CONSERVATION. I WILL DISCUSS:

1. THE ROLE OF THE CANADIAN ELECTRICAL ASSOCIATION AND THE GENERAL STRATEGY OF THE DOUBLE E PROGRAM;
2. THE PROGRAM OVERVIEW, AND
3. SOME OF THE HIGHLIGHTS SUCH AS THE DOUBLE E HOME, THE SUPER DOUBLE E HOME AND THE DOUBLE E MOTORS EFFORT.

I PROPOSE TO CONCLUDE BY EXAMINING SOME THE ANTICIPATED RESULTS.

C.E.A.'S ROLE

THE BASIC STRATEGY IN ALL PROGRAM DEVELOPMENT AND IMPLEMENTATION HAS BEEN FULFILLED AS FOLLOWS:

1. THE TECHNICAL BASE OR CORE OF THE PROGRAM IS UNIFORM ACROSS THE COUNTRY AND IS DEVELOPED, UNDER C.E.A. AUSPICES BY CUSTOMER SERVICES DIVISION COMMITTEES.

2. THE DOUBLE E PROGRAM IS NON-COMPETITIVE, THAT IS, APPLICABLE TO ALL FORMS OF ENERGY.

3. C.E.A.'S ROLE IS LIMITED TO PROGRAM CREATION AND DEVELOPMENT AND TO THE FOSTERING OF A MINIMUM AWARENESS LEVEL OF THE TRADES AND/OR PROFESSIONS INVOLVED. PROGRAM DEVELOPMENT USUALLY INCLUDES CENTRAL PRODUCTION OF RECOVERABLE MATERIALS AND OF A LIMITED NUMBER OF KEY RADIO AND TELEVISION SPOTS FOR UTILITY USE.

4. THE PROGRAM HAS MAXIMUM FLEXIBILITY. UTILITIES CAN IMPLEMENT, WITHIN THEIR SERVICE AREAS, PROGRAMS WHICH BEST SUIT THEIR REQUIREMENTS. THEY CAN ALSO IMPLEMENT THOSE PROGRAMS IN DIFFERENT DEGREES, FROM PURE INFORMATION TO FULL CERTIFICATION.

THE OVERALL CONCEPT OR STRATEGY OF THE DOUBLE E PROGRAM IS TO USE THE SAME BASIC LOGO OR SYMBOL TO IDENTIFY, IN TWO LANGUAGES, ALL INSTALLATIONS AND EQUIPMENT THAT MEET DEFINITE REQUIREMENTS AND CAN BE IDENTIFIED AS ENERGY EFFICIENT. THIS, WE FEEL, WILL ADD IMPACT TO THE PROGRAM AS IT UNFOLDS. IT WILL ALSO, WE HOPE, HELP TO REDUCE CONFUSION IN THE MARKET PLACE WHERE A GREAT MANY LOGOS IDENTIFIED WITH ENERGY EFFICIENCY ARE ALREADY IN USE.

PROGRAM OVERVIEW

HERE IS A GENERAL PLAN SHOWING THE VARIOUS ACTIVITIES AND THE PROJECTED IMPLEMENTATION SCHEDULES FOR PRELIMINARY WORK, TECHNICAL DEVELOPMENT, DEVELOPMENT OF MARKETING PROGRAM, BEGINNING OF ACTIVITY AND SUGGESTED DATES FOR REVISION OF GUIDELINES. IN THE RESIDENTIAL SECTOR, THE THREE ACTIVITIES ARE:

A) THE DOUBLE E NEW HOME PROGRAM TO INCITE BUILDERS TO CONSTRUCT HOMES TO THE PROGRAM'S HIGH ENERGY EFFICIENCY GUIDELINES.

B) FOR EXISTING HOMES, RETROFIT GUIDELINES ARE AVAILABLE, AND

C) THE SUPER DOUBLE E NEW HOME ACTIVITY DESIGNED TO IMPLEMENT THE LATEST TECHNOLOGICAL DEVELOPMENTS INTO THE BUILDING PROCESS.

IN THE COMMERCIAL AND INDUSTRIAL BUILDINGS ACTIVITY, THREE SEPARATE PROGRAMS ARE UNDER DEVELOPMENT:

A REGIONAL AWARD PROGRAM TO RECOGNIZE DESIGNS MEETING OR EXCEEDING A PUBLISHED DOUBLE E STANDARD. WE ALL KNOW THAT NEW BUILDINGS CAN BE (AND IN A FEW CASES ARE) DESIGNED TO USE LESS THAN 50% OF THE ENERGY USED BY EXISTING BUILDINGS OF THE SAME TYPE. THE C.E.A. STANDARDS BOOKLET IS NOW IN ITS FINAL STAGES BEFORE PRINTING AND THE PROGRAM WILL BE LAUNCHED ON TARGET AT THE END OF 1982. WORK ON THE COMMERCIAL AND INDUSTRIAL EXISTING BUILDINGS PROGRAM AND THE INNOVATIVE DESIGN PROGRAM IS CONTINUING IN ACCORDANCE WITH TARGET DATES SET IN THE DEVELOPMENT CHART.

THE DOUBLE E NON RESIDENTIAL APPLICATIONS PROGRAM ALSO HAS THREE PARTS:

A) THE INDUSTRY SECTOR AWARDS.

IN THIS PART OF THE PROGRAM, IT IS OUR INTENTION, WITH THE HELP OF PARTICIPATING UTILITIES, TO BUILD A DATA BASE THROUGH THE USE OF A STANDARD TOTAL ENERGY AUDIT FORM. SUCH A DATA BASE WILL BE USED TO IDENTIFY THOSE INDUSTRIES THAT HAVE ATTAINED ABOVE AVERAGE RESULTS IN EFFICIENT ENERGY USAGE.

B) A DATA BASE WILL ALSO BE COMPILED WITH THE HELP OF COOPERATING UTILITIES CONCERNING ENERGY EFFICIENT EQUIPMENT.

C) WORK ON THE DESIGN AWARDS FOR CONSULTANTS WILL PROCEED IN EARNEST NEXT YEAR.

THE DOUBLE E ELECTRIC MOTORS PROGRAM

THROUGH THIS ACTIVITY, WE PROPOSE TO DEVELOP CANADIAN STANDARDS THROUGH THE CANADIAN STANDARDS ASSOCIATION FOR ENERGY EFFICIENT MOTORS AND PROMOTE THEIR USE. SO MUCH FOR THE OVERVIEW.

THE FIRST ACTIVITY OF THE DOUBLE E PROGRAM WAS THE ENERGY EFFICIENT HOME. THE C.E.A. GUIDELINES ARE PRESENTLY THE MOST EXACTING IN CANADA FOR BUILDERS USING CONVENTIONAL CONSTRUCTION METHODS. THE GREAT MAJORITY OF CANADIAN UTILITIES HAVE USED THE PROGRAM IN THE NEW HOME MARKET AND DOUBLE E HOMES HAVE SPROUTED ACROSS THE COUNTRY. THE DOUBLE E PROGRAM CALLS FOR THE INSTALLATION OF C.S.A. PERFORMANCE CERTIFIED EQUIPMENT WHEN SUCH EQUIPMENT BECOMES AVAILABLE.

IN THE EXISTING MARKET, HOWEVER, THE SITUATION IS DIFFERENT. MANY UTILITIES, OFTEN AT THE REQUEST OF THEIR LOCAL PROVINCIAL GOVERNMENTS, HAVE LAUNCHED AUDIT PROGRAMS. RECOMMENDATIONS PERSUANT TO SUCH PROGRAMS MUST MEET COST EFFECTIVENESS CRITERIA AND ARE THEREFORE NOT COMPATIBLE WITH PRESCRIPTIVE RECOMMENDATIONS. IN GENERAL, RESIDENTIAL AUDIT PROGRAMS ARE MUCH SIMILAR TO YOUR RESIDENTIAL CONSERVATION SERVICE PROGRAMS.

THE SUPER ENERGY EFFICIENT OR SUPER DOUBLE E HOME PROGRAM IS IN ITS LAST STAGES OF DEVELOPMENT. IN THIS ACTIVITY, WE ARE ATTEMPTING TO COORDINATE OUR WORK WITH THE FEDERAL DEPARTMENT OF ENERGY MINES & RESOURCES CANADA, THAT HAS EXPRESSED ITS INTENTION TO ENCOURAGE THE CONSTRUCTION OF 1,000 SUPER ENERGY EFFICIENT HOUSES. THE FEDERAL PROGRAM WILL EMPHASIZE THE POTENTIAL FOR CONSTRUCTING SUPER EFFICIENT, AFFORDABLE RESIDENCES THAT WILL, DURING THE 1980'S, BE INCREASINGLY ATTRACTIVE IN THE MARKET PLACE BECAUSE OF THEIR LOW ENERGY USE FEDERAL FUNDS WILL SUPPORT DESIGN, TRAINING OF BUILDERS AND SUB-TRADES, EXTRA COSTS OF ENERGY SAVING FEATURES, MONITORING AND EVALUATION AND DISSEMINATION OF INFORMATION TO THOSE INVOLVED IN THE CANADIAN BUILDING INDUSTRY.

THE C.E.A. GUIDELINES CALL FOR AN ENERGY BUDGET WHICH SPECIFIES THAT IN A CLIMATIC ZONE UP TO 6400 F. DEGREE DAYS, THE MAXIMUM ANNUAL ENERGY REQUIREMENTS IN kWH PER SQUARE YARD PER YEAR ARE 55 FOR LIGHTING, APPLIANCES AND WATER HEATING AND 20 FOR SPACE HEATING. IN THE COLDEST ZONE, OF 14700° F. DEGREE DAYS AND OVER, THESE RESPECTIVE REQUIREMENTS ARE 55 FOR LIGHTING AND OTHER USES AND 55 FOR HEATING. AS YOU CAN READILY APPRECIATE, THE HEATING LOAD WHICH IN STANDARD HOUSING ACCOUNTS FOR AT LEAST TWO THIRDS OF THE ENERGY CONSUMPTION, IS REDUCED TO APPROXIMATELY ONE QUARTER OF THE TOTAL IN THE WARMER ZONES AND TO FIFTY PER CENT IN THE COLDER ZONES. THE YEARLY HEATING BILL FOR SUCH HOMES IS BETWEEN $100 AND $200, COMPARED TO TEN TIMES THAT AMOUNT FOR CONVENTIONAL HOMES.

THERE ARE FEW MANDATORY REQUIREMENTS FOR THE CONSTRUCTION OF SUPER DOUBLE E HOMES. HOWEVER, SUCH HOMES USUALLY INCORPORATE THE FOLLOWING FEATURES:

INSULATION LEVELS ARE INCREASED TO AS MUCH AS R 60 IN THE CEILINGS AND R 40 IN THE WALLS. THIS HIGH LEVEL OF INSULATION IS OFTEN ACHIEVED THROUGH DOUBLE WALL CONSTRUCTION. THERE IS A SPECIALLY SEALED AIR VAPOUR BARRIER.

THE AIR CHANGE IS REDUCED FROM AS MANY AS 24 CHANGES PER DAY TO AS LITTLE AS ONE COMPLETE CHANGE PER DAY. AN AIR-TO-AIR HEAT EXCHANGER CONTRIBUTES TO MAKING THE HOME MORE ENERGY EFFICIENT. THE STRUCTURE IS MOST OFTEN ORIENTATED TO TAKE ADVANTAGE OF PASSIVE SOLAR GAINS.

THE MAXIMUM ESTIMATED HEAT LOSS FROM SUCH HOMES AVERAGES BETWEEN THREE AND FOUR KILOWATTS.

SUCH HOMES INCLUDE ADDITIONAL FEATURES SUCH AS INSULATED DOORS, TRIPLE GLAZED WINDOWS AND ENERGY EFFICIENT APPLIANCES.

ANOTHER FIELD OF ACTIVITY WHICH, AT FIRST GLANCE, SEEMS RATHER UNLIKELY IS THE ENERGY EFFICIENT MOTOR. WE USED TO THINK THAT THE ELECTRIC MOTOR WAS A PRIME EXAMPLE OF EFFICIENCY. ANALYSIS HAS REVEALED THAT POTENTIAL GAINS IN EFFICIENCY AND HIGHER ENERGY PRICES MAKE HIGHER EFFICIENCY MOTORS A WORTHWHILE GOAL IN CONSERVATION. HIGHER EFFICIENCIES ARE ACHIEVED THROUGH THE USE OF

- INCREASED MAGNETIC MATERIAL
- INCREASED WIRE SIZE
- HIGHER QUALITY LAMINATION STEEL, AND
- CHANGES IN SLOT CONFIGURATIONS.

HIGHER EFFICIENCY MOTORS ARE FROM TWO TO TEN PER CENT MORE EFFICIENT THAN STANDARD UNITS. THE DOUBLE E MOTOR ACTIVITY WILL BE A LONG TERM PROGRAM SINCE TIME WILL BE REQUIRED TO RENEW EXISTING EQUIPMENT.

ANTICIPATED RESULTS

THE C.E.A. DOUBLE E PROGRAM WILL BENEFIT CANADIANS AND UTILITIES ACROSS CANADA TO THE VALUE OF BILLIONS OF DOLLARS IN THE NEXT 25 YEARS. ACCORDING TO MR. R. RACINE OF B.C. HYDRO, TECHNICAL COORDINATOR OF OUR PROGRAM"

"A) CALCULATIONS INDICATE THAT SINGLE FAMILY HOMES WITH CONSTRUCTION AND EQUIPMENT TO THE DOUBLE E REQUIREMENTS WILL SAVE OVER $150,000. PER HOME IN ENERGY COSTS DURING THE LIFE OF THE HOME COMPARED WITH CONVENTIONAL CONSTRUCTION.

B) THE C.E.A. RESEARCH AND DEVELOPMENT PROJECT NO. U 115 - "ENERGY ANALYSIS OF MAJOR HOUSE APPLIANCES", CONCLUDED THAT ENHANCEMENT OF APPLIANCE ENERGY EFFICIENCY WOULD CONFER NET BENEFITS WITH PRESENT DAY VALUES TO CANADA IN THE ORDER OF $3.1 BILLION, TO UTILITIES $1.9 BILLION AND TO PURCHASERS $2.0 BILLION. THE ABOVE SAVINGS ARE BASED ON TYPICALLY CURRENT 4¢ KWH. THE ACTUAL SAVINGS WOULD INCREASE IN PROPORTION TO ENERGY COST INCREASES WE CAN ANTICIPATE.

C) CONSERVATION IMPACT ANALYSES APPLIED TO CANADIAN ELECTRICAL USAGE OF SOME 236 000 GWH IN 1980 INDICATE PROBABLE NATIONAL ELECTRICITY SAVINGS POTENTIAL IN THE NEXT 25 YEARS TO THE ORDER OF:

- $2 BILLION/YEAR FROM ENERGY EFFICIENT MOTORS IN THE 1 TO 200 H.P. RANGE ALONE AND
- $3 BILLION/YEAR FROM LIGHTING ENERGY CONSERVATION."

IN ADDITION TO THESE BENEFITS, OTHERS PARTICULARLY IN THE COMMERCIAL AND INDUSTRIAL FIELD HAVE NOT YET BEEN QUANTIFIED.

I HOPE THAT THIS GENERAL OVERVIEW OF THE PRINCIPAL ELECTRIC UTILITY PROGRAMS HAS BEEN OF SOME INTEREST TO YOU.

THANK YOU FOR YOUR KIND ATTENTION.

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DECEMBER 1, 1981

"Energy Conservation - Retrospect & Prospect"

- a one-day seminar

The Energy Conservation Product and Service Industry - Boom Potential in a Growing Market

By

Richard Willingham - Editor and Associate Publisher

Energy Management Canada

Skyline Hotel, Ottawa
2nd December 1981

"SPAWNING A BILLION-DOLLAR BUSINESS" WAS THE TITLE OF A FEATURE ARTICLE PUBLISHED THIS APRIL IN THE U.S. MAGAZINE BUSINESS WEEK. THE THEME OF THE STORY WAS THAT ENERGY CONSERVATION BUSINESS IS ON THE THRESHOLD OF A MULTI-BILLION DOLLAR BOOM. COMPANIES WHICH HAVE A STAKE IN THE CANADIAN ENERGY CONSERVATION PRODUCT MARKET GREW VERY EXCITED INDEED ABOUT THIS ARTICLE. DARING TO BELIEVE THAT WHAT BUSINESS WEEK SAID WAS ABOUT TO HAPPEN IN THE U.S., COULD ALSO HAPPEN IN CANADA, THEIR HOPES WERE RAISED. THEY BEGAN TO CALCULATE WHAT THE EFFECT OF SUCH OPTIMISTIC PREDICTIONS WOULD BE ON THEIR OWN - AT PRESENT - QUITE TINY MARKETPLACE.

SOME SPECIFIC EXAMPLES OF THE BUSINESS WEEK FORECASTS WERE: A SIX-FOLD GROWTH IN SALES OF ENERGY MANAGEMENT SYSTEMS FOR BUILDINGS BETWEEN NOW AND 1990; A DOUBLING OF INDUSTRIAL HEAT RECOVERY SALES; COGENERATION SALES TO MULTIPLY 24 TIMES; RESIDENTIAL CONSERVATION EXPENDITURES TO GROW SEVEN FOLD; AND EVEN 10 TIMES THE SALES FOR MORE EFFICIENT ELECTRIC MOTORS. OVERALL, THE U.S. COULD EXPECT TO SEE AN $8.4 BILLION MARKET IN 1980 GROW TO $50 BILLION BY 1990. IN CANADIAN TERMS, WE ASKED, COULD AN ESTIMATED $1 BILLION MARKET IN 1979 TRANSLATE INTO A $5.7 BILLION MARKET BY 1990? PROBABLY, IT WILL GO MUCH HIGHER.

I'D LIKE TO MAKE ANOTHER DARING SUGESTION. IT IS, THAT A MARKET WHICH IS SO ILL-DEFINED, AND SO MISUNDERSTOOD, AND A MARKET WHICH INCLUDES SUPPLIERS WHO ARE NOT REALLY SURE WHETHER THEY ARE IN IT, OR OUT OF IT, HAS THE REAL POTENTIAL TO BE ONE OF THE MOST SUCCESSFUL GROWTH INDUSTRIES IN THE COMING DECADE.

THERE ARE NO WRITTEN DEFINITIONS OF THE COMPANIES WHICH FORM THIS INDUSTRY, AND NO DEFINITIONS OF THE PRODUCT GROUPS WHICH FIT INTO IT. THERE IS NO INDUSTRY ASSOCIATION. THERE ARE RELATIVELY FEW CANADIAN COMPANIES SPECIALISING PURELY IN ENERGY CONSERVATION. AND, ABOVE ALL, THERE CERTAINLY IS NO SPECIAL STATUS OR CREDIT GIVEN TO PRODUCT SUPPLIERS AS "PROVIDERS OF A MAJOR SOURCE OF ALTERNATE ENERGY". WHICH, IT CAN BE CONTENDED, THEY CERTAINLY ARE.

"ENERGY MANAGEMENT CANADA" MAGAZINE HAS, ON ITS FILES, THE NAMES OF OVER 2,000 COMPANIES WHICH SUPPLY ENERGY CONSERVATION PRODUCT OR SERVICE TO THE CANADIAN ENERGY USER. (IT SHOULD BE NOTED THAT, AT MOST, ONLY A FEW HUNDRED OF THESE ARE CANADIAN OWNED.) THE COMPANIES FIT INTO FOUR CATEGORIES:

THE LARGE COMPANIES COME IN THREE TYPES: FIRSTLY, THOSE WHERE THE MAJOR PRODUCT LINE IS ENERGY MANAGEMENT. THERE ARE VERY FEW OF THIS TYPE, EXCEPT FOR SOME CONTROL COMPANIES. SECONDLY, THERE ARE COMPANIES WHERE THE ENERGY CONSERVATION PRODUCT IS ONLY ONE OF SEVERAL PRODUCT RANGES; AND LASTLY, THERE ARE THOSE WHERE ENERGY CONSERVATION IS ONE APPLICATION OF, OR ONE FEATURE OF, ONE PARTICULAR PRODUCT.

TWO TYPES OF SMALLER COMPANY EXIST; THOSE WHICH SPECIALIZE IN SELLING ENERGY CONSERVATION PRODUCT, AND THOSE WHICH CAPITALIZE ON A NEWLY DISCOVERED FEATURE, OR APPLICATION OF, AN EXISTING PRODUCT LINE; FOR EXAMPLE, AIR CLEANING.

THE THIRD GROUP ARE THE CONSULTANTS. SOME ARE TRADITIONAL ENGINEERING CONSULTING FIRMS; OTHERS ARE SUBSIDIARIES OF THESE FIRMS, OR ACTUAL CONSULTING PRACTICES, TIED IN WITH A PARTICULAR PRODUCT LINE.

LASTLY, THERE IS THE CONTRACTOR/CONSULTANT. THIS IS THE INSTALLER WHO SPECIALIZES IN SELLING PRODUCT AND SUPPLYING A PARTICULAR LEVEL OF ENGINEERING AND/OR CONTRACTING SERVICE.

FOR CONVENIENCE, THE DISCUSSION PAPER FOR THIS SEMINAR HAS DEFINED THE VARIOUS INDUSTRIES INVOLVED IN ENERGY CONSERVATION INTO SIX VERY BROAD CATEGORIES.

LET'S LOOK BRIEFLY AT EACH OF THEM:

FIRST, <u>INSULATION AND OTHER THERMAL UPGRADING PRODUCTS</u>:
THIS INCLUDES WEATHERSTRIPPING, WINDOWS, GLAZING AND ROOFING MATERIALS, DOCK SHELTERS, SEALANTS, ETC. MUCH ATTENTION HAS BEEN FOCUSSED ON THE RESIDENTIAL INSULATION PROBLEM, BUT THERE ARE TWO OTHER AREAS OF SPECIAL INTEREST (1) THE INDUSTRIAL INSULATION OPPORTUNITY - WHICH IS STILL QUITE UNEXPLOITED AND (2) THE GROWTH OF AIR SEALING, OR AIR LEAKAGE CONTROL, OF BUILDINGS.

(2) - Heat Recovery: In the industrial sector (for both process and buildings), and in the commercial sector, this is the area which currently generates the greatest response and interest from readers of our publication. Larger companies are selling heat exchangers to the industrial and commercial sectors usually as just one of their product lines. But, several types of heat recovery equipment are available with application and engineering work from the contractor/consultant type companies. Much of the equipment is imported and the Canadian representatives appear to be growing rapidly in size and number.

(3) - Control Systems: A huge range of systems, from mechanical timers and double setback thermostats at $100 each, to computerized building automation and process control systems up to several hundreds of thousands of dollars are included in this category. The market for middle-range energy management systems from 4 to 64 points is rapidly expanding. There are now 400 companies in this bracket in the U.S. Probably 50 to 100 of these systems are available in Canada, and many of them are installed by the contractor/consultant type. Problems of product performance have already arisen in this area. The control market now includes lighting, and 2 major commercial building lighting control systems are now installed in Canada. Also markets worthy of note are for new motor and fan control systems, boiler and furnace monitoring and control systems.

(4) - Cogeneration: This includes energy from waste, district heating; several consultants are involved, but there is very little activity in Canada. There is, however, big potential. In Energy-From-Waste, there are no Canadian installations which actually generate electricity for sale.

(5) - Greater Efficiency for end-use Devices: This includes: electric motors, lighting, automobiles. Technology here is mostly non-Canadian. Some manufacturing is done in Canada, but mostly by large international companies. Energy efficient lighting is well-established in the industrial and commercial sectors, and there is still potential for growth. The electric motor market is waiting for large electrical rate increases to justify retrofit.

And lastly, services: This includes consulting, energy audits, design for new construction and retrofit, policy analysis, etc. There are still relatively few of these consultants, but a growing number is showing interest in the field. Attractive opportunities exist in basic energy auditing techniques for all sectors, and energy-user and employee education.

THERE IS NO QUESTION THAT COMPANIES MARKETING ENERGY CONSERVATION PRODUCTS OR SERVICES IN CANADA ARE ENTERING A NEW PHASE OF ACTIVITY. ALTHOUGH METHODS ARE BEING EXPLORED TO BREAK DOWN EXISTING BARRIERS TO ENERGY CONSERVATION, NEW ONES MAY BE ENCOUNTERED AS WE ENTER THIS SECOND PHASE.

THE FIRST CONSIDERATION FOR MOST ENERGY USERS FACED WITH THE ENERGY CONSERVATION INVESTMENT DECISION IS SIMPLE PAYBACK. INCENTIVE PROGRAMS FROM GOVERNMENT HAVE CUT PAYBACK PERIODS IN ORDER TO MAKE THE INVESTMENT MORE ATTRACTIVE. HOWEVER, THERE ARE STILL PROBLEMS.

THE TWO BIGGEST BARRIERS SEEM TO BE PERCEPTION AND PRIORITIES. PERCEPTION OF ENERGY CONSERVATION AS A MAJOR ALTERNATE ENERGY SOURCE DOES NOT EXIST IN THE MINDS OF MOST BUSINESS PEOPLE AND CONSUMERS IN THE WAY IT DOES IN THIS CONFERENCE ROOM TODAY. PRIORITY TO THE ENERGY CONSERVATION INVESTMENT MAY NOT BE GIVEN UNTIL FULL ECONOMIC JUSTIFICATION IS MADE, PROBABLY USING FULL LIFE CYCLE COSTING. BUT, SUCH INVESTMENT DECISIONS HAVE INDEED BEEN TAKEN. INDUSTRIAL COMPANIES ALONE HAVE IMPROVED ENERGY EFFICIENCY BY 15% SINCE 1972. THERE'S LITTLE DOUBT THAT INDUSTRY HAS SEEN THE PAYBACKS POSSIBLE FROM QUITE SIMPLE HOUSEKEEPING AND MINOR RETROFIT WORK. IT SEEMS ODD, HOWEVER, THAT SOME OF THE INVESTMENTS HOMEOWNERS ARE BEING ASKED TO MAKE, HAVE LONGER PAYBACKS THAN MOST BUSINESSES WOULD DREAM OF.

LET'S LOOK AT IT FROM THE ENERGY CONSERVATION INDUSTRY'S POINT OF VIEW:

THE BARRIERS TO ENERGY CONSERVATION INVESTMENT HAVE BECOME ALL TOO FAMILIAR. IN THE COMMERCIAL SECTOR PARTICULARLY, SUPPLIERS OF ENERGY MANAGEMENT SYSTEMS REGULARLY CITE THE LANDLORD/TENANT SPLIT OF COSTS/ BENEFITS AS A MAJOR OBSTACLE.

WHEN THERE IS NOT SUBSTANTIAL, OR INDEED OVERWHELMING, MOTIVATION IN THE MARKETPLACE, HOW CAN THE ENERGY CONSERVATION SUPPLIER BE EXPECTED TO BE ENTHUSIASTIC ABOUT INVESTING IN PRODUCTION CAPACITY AND SALES PROMOTION? LET'S BE SURE OF ONE THING, UNLESS THE PRODUCT SUPPLIER IS MOTIVATED AND BULLISH, AND THEREFORE ACTIVE IN THE MARKET, THE CHANCES OF SUCCESS IN MOTIVATING THE ENERGY USER TO RETROFIT AND INSTALL "MORE ENERGY EFFICIENT" EQUIPMENT, WILL BE GREATLY REDUCED.

FINALLY IN RESPONSE TO A REQUEST FROM THE ORGANIZERS, I'D LIKE TO ADDRESS THE QUESTION OF WHETHER THERE SHOULD BE AN INDUSTRY ASSOCIATION.

TRADE ASSOCIATIONS ARE THE PREROGATIVE OF COMPANIES COMPETING WITH EACH OTHER IN A SPECIFIC MARKETPLACE. THEY ARE CREATED FOR A NUMBER OF REASONS AND WITH VARIED OBJECTIVES. ANY DECISION TO CREATE A CANADIAN ASSOCIATION OF ENERGY CONSERVATION INDUSTRIES WOULD HAVE TO BE MADE BY THAT INDUSTRY, AND ITS PARTICIPANTS.

IT HAS BEEN SUGGESTED THAT AN ENERGY CONSERVATION INDUSTRY ASSOCIATION COULD HELP IN THE FOLLOWING AREAS:

1. PROVIDING A STATISTICAL BASE FOR ITS PARTICIPANTS, AND FOR GOVERNMENT AGENCIES, ON TOTAL RETROFIT INVESTMENT AND POTENTIAL ENERGY SAVINGS.

2. COMMISSIONING OF WRITTEN PERFORMANCE STANDARDS FROM AN ORGANIZATION. SUCH AS THE CANADIAN STANDARDS ASSOCIATION

3. IDENTIFYING MAJOR ENERGY CONSERVATION POTENTIAL FROM CUSTOMER FEEDBACK.

4. INPUT INTO GOVERNMENT PROGRAMS FOR INCENTIVES TO ENERGY USERS, POSSIBLE LEGISLATION, REGULATION, AND BUILDING CODES.

5. SETTING UP CODES OF PRACTICE FOR CONSULTANTS, CONTRACTORS AND MANUFACTURERS.

6. PARTICIPATION IN ENERGY EFFICIENCY RESEARCH AND DEVELOPMENT, AND PERHAPS FUNDING; AND

7. ACCESS TO NON-CANADIAN EXPERIENCE THROUGH MULTI-NATIONAL COMPANIES.

IT CERTAINLY IS TRUE THAT THIS PARTICULAR INDUSTRY IS ILL-DEFINED, AND THAT VERY FEW OF THE COMPANIES INVOLVED ARE INVOLVED SOLELY IN ENERGY CONSERVATION. THERE IS, HOWEVER, GOOD REASON TO BELIEVE THAT A CLOSER LOOK AT THE COMMON INTERESTS OF THE RELEVANT COMPANIES COULD BE OF BENEFIT BOTH TO THEM AND TO THE OBJECTIVE OF GREATER CANADIAN ENERGY EFFICIENCY.

THANK YOU

Notes for a talk by:

Bill Bartlett
Manager
Energy Products Centre
Residential Division
Honeywell Ltd.

At the seminar:

ENERGY CONSERVATION - RETROSPECT AND PROSPECT

Ottawa, 2 December 1981

HONEYWELL IN CANADA IS A MULTI DIVISIONAL, COMPANY WITH PRODUCTS AND SERVICES THAT TODAY CAN SERVE A VERY WIDE SPECTRUM OF CANADIAN ENERGY CONSERVATION REQUIREMENTS.

OUR CONTROL INSTALLATIONS RANGE ALL THE WAY FROM LARGE INDUSTRIAL CONTROL PROJECTS THROUGH ALL SIZES OF INDUSTRIAL AND COMMERCIAL APPLICATIONS TO RESIDENTIAL HEATING AND AIR CONDITIONING SYSTEMS. WE ADDRESS BOTH THE NEW AND THE EXISTING MARKET.

OUR PRODUCTS AND SERVICES TODAY CAN COVER COMPLETE TURN KEY CAPABILITIES, WE CAN SUPPLY AND INSTALL, SUPPLY AND SUPERVISE, OR SUPPLY THROUGH TRAINED MARKETING CHANNELS. WE ARE A FULLY INTEGRATED COMPANY WITH CANADIAN MANAGEMENT, MARKETING, SALES, RESEARCH AND DEVELOPMENT, AND MANUFACTURING CAPABILITIES.

TO KEEP WITHIN THE TIME ALLOCATED TO ME, I WILL RESTRICT MY DISCUSSIONS TO THE ENVIRONMENTAL AND ELECTRICAL LOAD MANAGEMENT SYSTEMS FOR THE COMMERCIAL SECTOR WITH SOME REFERENCES TO RESIDENTIAL.

IT SHOULD BE STATED AT THE OUTSET THAT HONEYWELL BY THE VERY NATURE OF ITS PRODUCT OFFERING HAS ALWAYS BEEN IN THE ENERGY MANAGEMENT BUSINESS.

ALMOST EVERY PRODUCT THAT WE MANUFACTURE OR EVERY SERVICE THAT WE RENDER REFLECTS THE CONSERVATION OF ENERGY. A SIMPLE EXAMPLE OF THIS, IS THE ORDINARY THERMOSTAT ON THE WALL OF PRACTICALLY EVERY HOME. THIS VERY ORDINARY, INEXPENSIVE, UNGLAMOROUS DEVICE HAS THE CAPABILITY TO PROPORTION JUST THE CORRECT AMOUNT OF ENERGY TO THE OCCUPANT TO SATISFY THEIR COMFORT AND ENERGY SAVING NEEDS. IT PREVENTS UNDERSHOOTING AND OVERSHOOTING WITH RESULTANT WASTAGE OF ENERGY. I MIGHT SAY THAT IT HAS TO BE CORRECTLY APPLIED TO OPERATE IN THE MOST EFFECTIVE MANNER. IT DOES HOWEVER HAVE GREAT TOLERANCE AND CAN COPE WITH POORLY CONSTRUCTED STRUCTURES AND BADLY DESIGNED SYSTEMS.

HONEYWELL HAS ALWAYS OFFERED SETBACK THERMOSTATS AS WELL, BUT UNTIL THE "ENERGY CRUNCH" OF 1974 THIS FAMILY OF DEVICES CONSTITUTED A VERY MINUTE PORTION OF OUR TOTAL SALES. THEY WERE SOLD ON A "COMFORT" BASIS FOR THOSE PEOPLE WHO LIKED TO SLEEP "COOL". CONVERSATION OF ENERGY WAS AN AFTERTHOUGHT. IN FACT, OUR SLOGAN IN THOSE DAYS WAS "SLEEP COOL - SAVE FUEL".

WE ALSO MANUFACTURED A COMPLETE LINE OF COMMERCIAL INDUSTRIAL DEVICES TO DO THE SAME JOB. WE SOLD VERY FEW OF THESE.

THE BEST SUCCESS WE HAD WAS TO CONVINCE BUILDING OWNERS TO USE INDIVIDUAL ROOM CONTROL OR ZONE CONTROL SYSTEMS ON A COMFORT BASIS, TO HELP RENT ACCOMMODATION OR KEEP OFFICE WORKERS HAPPY,

THE INCREASE IN THE USE OF COMMERCIAL AIR CONDITIONING ALSO ASSISTED IN PROMOTING THE USE OF CONTROLS IN COMMERCIAL INDUSTRIAL BUILDINGS.

WHEN THE SO CALLED ENERGY CRISIS HIT IN 1974, WE REALIZED THAT THERE WAS A VERY LARGE IMMEDIATE MARKET CREATED FOR THE ENERGY MANAGEMENT CONTROL SYSTEMS THAT WE HAD ALREADY IN STOCK. ONE OF OUR PROBLEMS WAS TO GET THE INFORMATION TO THE CONSUMER TO LET THEM KNOW THAT IT WAS POSSIBLE FOR THEM TO PURCHASE THESE DEVICES.

IN THE EXISTING RESIDENTIAL SECTOR WE COULD NOT AFFORD TO REACH THE HOME OWNER, WHO COULD MAKE THE BUYING DECISION. IN THE NEW HOUSE MARKET THE MESSAGE FELL ON DEAF EARS. THE BUILDER HAD NO INCENTIVE TO INSTALL ANY ENERGY EFFICIENT EQUIPMENT IN HIS NEW HOME. TODAY THE SAME IS LARGELY TRUE ALTHOUGH THERE ARE SOME BUILDERS OFFERING ENERGY EFFICIENT MODELS. I'M NOT SURE HOW SUCCESSFUL THEY ARE.

IN THE COMMERCIAL-INDUSTRIAL SECTOR WHEN CALLING ON BUILDING OWNERS WE EMPHASIZED ENERGY MANAGEMENT SYSTEMS TO SAVE ENERGY, BUT ONCE AGAIN OUR MESSAGE LARGELY FELL ON DEAF EARS. THERE WERE NO INCENTIVES TO SPEND THE EXTRA MONEY TO SAVE THIS PRECIOUS ENERGY.

IT WAS SOON REALIZED ON OUR PART THAT WE WERE NOT GOING TO BE SUCCESSFUL IN SELLING OUR PRODUCTS AND SERVICES USING ENERGY SAVING ALONE, ALTHOUGH I WILL SAY THAT SOME INDIVIDUALS AND CORPORATIONS COMMITTED THEMSELVES VERY EARLY TO THE CONSERVATION OF ENERGY FOR THE GOOD OF THE COUNTRY AND FUTURE GENERATIONS. THERE WERE NOT ENOUGH OF THESE HOWEVER ON WHICH TO BUILD OUR BUSINESS.

WE FOUND THAT PEOPLE WERE CONFUSED AND VERY SUSPICIOUS OF BIG GOVERNMENT, BIG CORPORATIONS AND BIG UTILITIES. THIS WAS CONFIRMED BY A MARKET STUDY DONE BY A LARGE GAS UTILITY. THE GENERAL PUBLIC WAS MISINFORMED AND CONFUSED ABOUT THE ENERGY SITUATION.

WE ALSO FOUND THAT WE WERE NOT CORRECTLY ORGANIZED IN OUR SALES AND MARKETING AREAS TO ADDRESS THESE NEW MARKET OPPORTUNITIES.

WHILE WE REALIZED THAT WE WERE NOT CORRECTLY ORGANIZED TO ADDRESS THIS OPPORTUNITY, IT WAS ALSO UNDERSTOOD THAT THE FLEDGLING ENERGY MANAGEMENT BUSINESS WAS NOT LARGE ENOUGH TO ECONOMICALLY SUPPORT SEPARATE SALES, MARKETING, ENGINEERING AND MANAGEMENT FUNCTIONS. THE BUSINESS WAS THEREFORE PURSUED WITH THE RESOURCES WE HAD.

WE ALSO KNEW THAT WHILE WE HAD MANY PRODUCTS AND SERVICES TO OFFER, THERE WERE MANY OTHER OPPORTUNITIES FOR WHICH EITHER THE PRODUCT WAS NOT EXACTLY SUITABLE OR WE DID NOT HAVE A PRODUCT OR SERVICE AVAILABLE.

A VERY SIMPLE EXAMPLE IS THE CASE OF THE SETBACK THERMOSTAT - SINCE IT HAS AN ELECTRIC CLOCK IN IT, AN EXTRA PAIR OF WIRES HAD TO BE PULLED UP TO THE THERMOSTAT LOCATION. THIS INCREASED THE TOTAL INSTALLATION COST AND PREVENTED AN OWNER FROM INSTALLING IT THEMSELVES, AND THUS REDUCED THE SIZE OF MARKET.

A BATTERY DRIVEN MODEL WAS DEVELOPED WHICH CHARGED THE BATTERY ON THE OFF CYCLE. IT COULD REPLACE THE EXISTING THERMOSTAT WITH NO EXTRA WIRING AND THUS THE DO IT YOURSELF MARKET WAS AVAILABLE.

IT WAS ALSO APPARENT THAT WHILE THERE WAS A VERY LARGE MARKET OUT THERE WE HAD NOT DEVELOPED THE CORRECT SELLING TECHNIQUE TO ADDRESS IT. WE THEREFORE CHANGED TO SELLING ON A R.O.I. BASIS.

THIS HAD MANY IMPLICATIONS INCLUDING THE DEVELOPMENT OF COMPUTER ASSISTED ANALYSES AND SURVEYS, AND THE TRAINING OF OUR PEOPLE AND OUR CUSTOMERS IN THE USE OF THIS SELLING TECHNIQUE.

AS WE CONTINUED TO ADDRESS THE ENERGY MANAGEMENT MARKET WE SAW THAT THERE WERE MANY OPPORTUNITIES TO (A) ENLARGE THE BUSINESS IN WHICH WE WERE ALREADY INVOLVED, (B) ENTER NEW MARKETS WITH NEW PRODUCTS.

TYPICAL OF THE FIRST WAS THE DEVELOPMENT OF THE COMPLETE BUILDING AUTOMATION SYSTEM AND THE ENLARGEMENT OF MAINTENANCE OF EXISTING BUILDINGS TO EMPHASIS THE UPGRADING TO MORE ENERGY EFFICIENT SYSTEMS. TYPICAL OF THE SECOND WAS THE IDENTIFICATION OF OPPORTUNITIES TO CONTROL ELECTRICAL POWER AND THE DEVELOPMENT OF A NEW CONTROL SYSTEM FOR FLOURESCENT LIGHTING. THIS LIGHTING CONTROL SYSTEM WAS CONCEIVED, DESIGNED AND MANUFACTURED IN CANADA BY HONEYWELL LIMITED - WE EXPECT TO BE EXPORTING THESE SYSTEMS IN THE NEAR FUTURE BY THE WAY.

AS WE DEVELOPED OUR ENERGY MANAGEMENT PLANS IT BECAME VERY APPARENT THAT INTENSIVE TRAINING WOULD BECOME A VERY NECESSARY INGREDIENT AS WE NOT ONLY USED DIFFERENT SELLING AND MARKETING TECHNIQUES, BUT ALSO INTRODUCED NEW PRODUCTS FOR EXISTING MARKETS AND ENTERED NEW MARKETS.

IT WAS NECESSARY NOT ONLY TO TRAIN OUR OWN FIELD SALES MARKETING, SUPERVISORY AND INSTALLATION PEOPLE, BUT IT WAS ALSO NECESSARY TO TRAIN OUR O.E.M.'s, DISTRIBUTORS AND INSTALLING CONTRACTORS.

THAT IS WHERE WE HAVE BEEN, LET US LOOK AT WHERE WE ARE NOW-

TODAY WE HAVE POSITIONED OUR SALES, MARKETING AND ENGINEERING CAPABILITIES TO START TO TAKE ADVANTAGE OF THE OPPORTUNITIES AVAILABLE TO US. I SAY START BECAUSE WE ARE NOT YET COMPLETELY READY AND PERHAPS WILL NEVER EVER REACH A POSITION WHERE WE ARE SATISFIED, BECAUSE OF THE RAPIDLY CHANGING TECHNOLOGY TO APPLY TO THE MARKET.

THE PRESENT ECONOMIC CLIMATE HAS ALSO EFFECTED CERTAIN SEGMENTS OF OUR BUSINESS CAUSING DELAYS IN THE RATE OF DEVELOPMENT OF OUR CAPABILITIES. ROI SELLING IS TOUGHER BECAUSE OF HIGH INTEREST RATES AND RESULTANT EXPECTED SHORTER PAY BACKS.

TO GIVE YOU SOME EXAMPLES OF WHAT WE HAVE DONE TODAY HOWEVER, WE HAVE BEEN ABLE TO DEDICATE SALES, MARKETING AND RESEARCH CAPABILITIES TO THE ENERGY MANAGEMENT SECTOR OF OUR BUSINESS.

SOME OF THESE CHANGES ARE ONLY AS RECENT AS THE BEGINNING OF THIS YEAR AND ARE NOT FULLY COMPLETED.

WE HAVE SUPPLIED AND INSTALLED BY OUR COMMERCIAL OR CONTRACT DIVISION MANY LARGE COMPLETE BUILDING AUTOMATION SYSTEMS IN NEW BUILDINGS. AS WELL, WE HAVE SOLD A VERY WIDE RANGE OF

LESS COMPLEX, BUT VERY EFFECTIVE SYSTEMS AND PRODUCTS TO A WIDE VARIETY OF NEW AND EXISTING MEDIUM AND SMALL BUILDING OWNERS. SOME OF THESE SYSTEMS WERE INSTALLED BY OUR COMMERCIAL OR CONTRACT DIVISION, SOME BY OUR TRAINED DISTRIBUTORS AND SPECIALIZED ENERGY MANAGEMENT CONTRACTORS.

AS STATED EARLIER, WE HAVE DEVELOPED NEW SYSTEMS FOR EXISTING MARKETS AND NEW SYSTEMS FOR NEW MARKETS. ENERGY MANAGEMENT HAS BECOME A SIGNIFICANT AND GROWING SEGMENT OF OUR BUSINESS. WE PERCEIVED AS WE BECOME MORE INVOLVED IN THIS BUSINESS THAT THERE ARE STILL MANY NEW AREAS TO APPLY EXISTING PRODUCTS AND AREAS WHERE PRODUCTS CAN BE DEVELOPED TO SAVE ENERGY --

LOOKING BACK OVER THE LAST SEVEN YEARS SINCE 1974, THERE ARE SEVERAL LESSONS TO BE LEARNED.

THE BUYER HAS BEEN CONFUSED, AND POSSIBLY STILL IS ABOUT THE ENERGY PICTURE IN CANADA.

SEVERAL MEASURES HAVE BEEN IMPLEMENTED BY THE VARIOUS GOVERNMENT AGENCIES. SOME HAVE WORKED WELL, SOME HAVE CREATED CONFUSION WITH THE END USER.

I WOULD LIKE TO MAKE SOME COMMENTS ABOUT THE COSP PROGRAM BECAUSE THIS ONE IMPACTED DIRECTLY ON OUR BUSINESS.

IN THE LATE SUMMER AND FALL OF 1979, THERE WAS A REAL UPTURN IN CONVERSION FROM OIL TO GAS. THIS WAS TRUE RIGHT ACROSS THE BOARD FROM RESIDENTIAL TO COMMERCIAL AND INDUSTRIAL. GAS UTILITIES, GAS BURNER MANUFACTURERS AND SUPPLIERS TO THE MANUFACTURERS WERE ALL GOING FLAT OUT TO CATCH UP TO THE SUDDEN DEMAND FOR PRODUCT AND SERVICES.

THIS SUDDEN SURGE WAS NOT RELATED TO ANY INCENTIVE PROGRAM; IT WAS JUST THE REALIZATION BY THE END USER THAT IT MADE GOOD SENSE TO SWITCH FROM OIL TO GAS. THE MARKET PLACE WAS DRIVING THE BUSINESS.

THEN IN 1980, WORD BEGAN TO CIRCULATE THAT THERE WAS TO BE AN INCENTIVE PROGRAM SPONSORED BY THE FEDERAL GOVERNMENT TO GET OFF OIL. THE CONSUMER DECIDED TO WAIT TO SEE WHAT THE INCENTIVES WOULD BE. OUR CUSTOMER'S INVENTORIES BUILT AND BUSINESS GROUND TO A HALT.

TO ADD FURTHER TO THE CONFUSION MANY DIFFERENT CHOICES WERE PRESENTED TO THE CONSUMER IN THE LIGHT OF ENERGY CONSERVING DEVICES SUCH AS MEDIUM AND HIGH EFFICIENCY UNITS, ADD ON UNITS, VARIOUS SCENARIOS WERE INDICATED BY THE PROVINCIAL GOVERNMENTS WITH HINTS ABOUT EVEN MORE INCENTIVES TO BE HAD IN THE FUTURE. SPECULATION BETWEEN GAS AND ELECTRIC RATES STILL HAVE MANY PEOPLE PUZZLED, SO MANY HAVE ADOPTED THE WAIT AND SEE ATTITUDE.

WHAT HAVE WE LEARNED FROM THIS EXPERIENCE.

FROM OUR STANDPOINT WE VIEW THE BUSINESS CYCLE AS A VERY LARGE OCEAN LINE SAILING ALONG SLOWLY AND MAJESTICALLY. ANY CHANGES IN THIS PROCEDURE MUST BE CAREFULLY CONSIDERED AND ALL THE FACETS WELL THOUGHT OUT IN ORDER TO ALTER THE COURSE. ANY SUDDEN CHANGE IS LIKE AN ICEBERG SUDDENLY APPEARING AND CONFUSION REIGNS.

IN THE CASE OF THE COSP PROGRAM, INFORMATION WAS RELEASED TOO SOON BEFORE ALL SEGMENTS OF THE INDUSTRY WERE READY. TOO MANY OPTIONS WERE POSSIBLE WITHOUT EXPLANATIONS OF THE CONSEQUENCES. INDUSTRY WAS NOT KEPT INFORMED WITH RESULTANT CONFUSION THERE ALSO. MANY MANUFACTURERS WERE NOT, AND SOME STILL ARE NOT SURE, WHAT PRODUCTS TO MANUFACTURE AND OFFER FOR SALE.

THERE WERE NOT ENOUGH TRAINED PEOPLE READY, AND SOME OF THE EQUIPMENT DISCUSSED OR RECOMMENDED WAS NOT AVAILABLE FOR SALE. CONTRACTORS STILL ARE CONFUSED AND MANY OPPORTUNITIES ARE BEING LOST FOR CONSERVATION.

IN THE FUTURE IT IS BELIEVED THAT ALL SEGMENTS OF INDUSTRY SHOULD BE INVOLVED SO THAT AN ORDERLY PLAN CAN BE LAID OUT TO GET READY FOR SUCH A MASSIVE PROGRAM. IT IS REALIZED THAT THERE HAS BEEN CRITICISM FROM THE GENERAL PUBLIC THAT INDUSTRY IS SLOW TO REACT BUT IT DOES TAKE MANY MONTHS TO

CLEAR INVENTORIES, PUT NEW PRODUCTS INTO THE FIELD AND TRAIN EVERYONE ON HOW TO SELL, INSTALL AND SERVICE THE NEW EQUIPMENT.

I BELIEVE THAT WHAT WE HAVE LEARNED FROM THE COSP EXPERIENCE IS THAT ANY BUSINESS IS VERY SENSITIVE TO SUDDEN CHANGES, AND GOOD COMMUNICATION IS VERY NECESSARY BEFORE INTRODUCING ANY FACTORS THAT WILL UPSET THE DESIGN, MANUFACTURING, SALES, INSTALLATION AND SERVICE NETWORK.

GOOD COMMUNICATION BETWEEN GOVERNMENT AND INDUSTRY IS VITAL.

I WAS ASKED TO MAKE SOME COMMENTS ABOUT THE FUTURE OF OUR BUSINESS.

IT IS CERTAINLY OUR INTENTION TO CONTINUE TO PURSUE THE ENERGY CONSERVATION BUSINESS IN CANADA. THERE ARE MANY OPPORTUNITIES OUT THERE.

WE WILL CONTINUE TO BUILD OUR ORGANIZATION SO WE WILL REQUIRE A POOL OF GOOD PEOPLE, EDUCATED IN THIS INDUSTRY FROM WHICH TO DRAW.

THE TRAINING ROLE WILL REMAIN A KEY ACTIVITY AT ALL LEVELS AND R & D WILL BE VERY IMPORTANT TO DEVELOP NEW PRODUCTS.

A GOOD BUSINESS CLIMATE IS NECESSARY FOR PRIVATE INDUSTRY TO GROW.

THE CHALLENGES THEN THAT WE WOULD THROW OUT ARE AS FOLLOWS.

LET ME PREFACE THESE REMARKS BY SAYING THAT I AM NOT AN EXPERT IN GOVERNMENT AFFAIRS AND SOME OF THESE SUGGESTIONS MAY ALREADY BE IN THE MILL.

HOWEVER, IN BROAD TERMS HERE ARE THE CHALLENGES.

INCENTIVES COULD BE GIVEN TO BUILDERS TO BUILD ENERGY EFFICIENT STRUCTURES.

COMMUNITY COLLEGES AND UNIVERSITIES COULD BE KEYING INTO ENERGY CONSERVATION TO GRADUATE PEOPLE WHO ARE TRAINED IN THESE AREAS, TO PROVIDE THE MANPOWER POOL REFERRED TO EARLIER.

INCENTIVES COULD BE GIVEN TO PRIVATE INDUSTRY FOR R & D ON ENERGY CONSERVATION EQUIPMENT.

FINALLY, A GOOD BUSINESS CLIMATE COULD BE DEVELOPED BY BROADENING TAX INCENTIVE MEASURES AND BY GOOD COMMUNICATION WITH PRIVATE INDUSTRY. THIS DOES INCLUDE COMMUNICATIONS WITH INDUSTRY ASSOCIATIONS LIKE HRAI, CIPH, EEMAC, TO NAME A FEW.

TO CONCLUDE THEN - IT IS OUR FIRM BELIEF THAT MOST CANADIANS DO UNDERSTAND THAT WE ARE BLESSED WITH GOOD SUPPLIES OF ENERGY WITH PROSPECTS FOR MORE IN THE FUTURE. WE BELIEVE ALSO THAT MOST CANADIANS DO WANT TO SAVE ENERGY FOR THE COUNTRY AND FOR FUTURE GENERATIONS, BUT AT THE PRESENT TIME ARE CONFUSED.

IF MORE COMMUNICATION PROGRAMS WERE SET UP, AND A GOOD BUSINESS CLIMATE DEVELOPED, THEN CANADIAN PRIVATE INDUSTRY MOST CERTAINLY HAS THE CAPABILITY TO RESPOND AND PROVIDE THE APPROPRIATE GOODS AND SERVICES TO ANSWER CANADIAN ENERGY CONSERVATION NEEDS.

Energy Conservation Seminar
"Retrospect and Prospect"
Skyline Hotel - Ottawa
December 2, 1981

PANEL PRESENTATION
BUSINESS OPPORTUNITIES IN THE ENERGY CONSERVATION MARKET

Speaker

Frank W. Henkelman, President
Fiberglas Canada Inc.

ENERGY CONSERVATION SEMINAR

"RETROSPECT AND PROSPECT"

SKYLINE HOTEL - OTTAWA

DECEMBER 2, 1981

PANEL PRESENTATION - BUSINESS OPPORTUNITIES IN THE ENERGY CONSERVATION MARKET

SPEAKER - FRANK W. HENKELMAN, PRESIDENT
FIBERGLAS CANADA INC.

Fiberglas Canada is the industry leader in the market segment described by Graham Armstrong, our Workshop Chairman, as "the largest segment of the conservation industry - insulation."

In addition we are involved as a material supplier to the reinforced plastics industry which is playing a significant role in energy conservation as well.

Our products are reasonably well-known. They include Fiberglas Pink Home Insulation, insulation for appliances, for commercial use in buildings and a variety of industrial uses such as insulation for piping, storage vessels and equipment of various kinds.

WHAT THE EXPANDING ENERGY CONSERVATION MARKET HAS MEANT TO FIBERGLAS CANADA

As a broad indicator it may interest you to know that our business has grown from -

$15,000,000 and 900 employees in 1961
to $60,000,000 and 1,600 employees in 1971
to $325,000,000 and 2,800 employees in 1981

SLIDE 1 VOLUME INCREASE 1970 - 1981

This slide shows the growth in units sold for two major insulation product areas.

The bottom portion of the slide shows the growth in our Home Insulation Products over the period with a very rapid increase since the Arab embargo in 1973. This growth is made up of the higher insulation levels in new houses and the upgrading of insulation in existing homes. When it is recognized that the new houses built in a year represent only 3% of the existing housing stock, it will be understood that the 6 - 7,000,000 existing houses represent the biggest opportunity by far. However, we would estimate that only 40% to 50% of our product reaches this market now.

In 1970 over 80% of our production was in the R-7 to R-10 range with an average R-value of 8.2. Ten years later 80% of our production was in the R-12 to R-28 range with an average value of 16.5. Something appears to be happening.

In the Commercial and Industrial sector our greatest growth has been with roof insualtion used on commercial buildings such as shopping centres and on warehouses and factories.

This growth, however, cannot be credited primarily to energy conservation. It has come both from growth in the number of buildings and from an increase in market share for this product. The increase in product thickness, which is a measure of the energy efficiency perception, has been less than 5% per year.

When the Measures for Energy Conservation were published in 1978, roof insulation thicknesses required would have been between 4" and 7". You are aware, of course, that the Measures were never implemented and our average thickness sold is still only about 2". It is evident that major barriers still remain.

This same story holds for other Commercial and Industrial products such as pipe insulation. The expected greater thicknesses of insulation have materialized only to a minor degree.

The previous serious barrier of subsidized energy prices is now being gradually removed as a consequence of the recent energy agreements. It is unfortunate that it is being replaced by the barrier of high interest rates.

Our rapid growth has been sustained primarily by the increasing demand for Home Insulation. As some evidence of this growth, these slides will show you quickly that we built three new insulation plants in 1976, 1978 and 1980 in Moncton, N. B., Toronto and Mission, B. C., near Vancouver. In addition, our other three insulation plants have expanded to almost double their 1973 capacity.

SLIDES 2 & 3

For your interest, insulation is not the only part of our business which is allied to energy conservation.

Fiberglas Reinforced Plastics are playing an important part in decreasing the weight of automobiles and providing corrosion resistant material to replace steel and aluminum in pulp and paper, chemical and potash industries, as examples. These reinforced plastic components are produced at lower energy inputs then the competitive metals and in many applications are far more durable.

SLIDES 4, 5, 6

WHAT THE ENERGY CONSERVATION MARKET WILL MEAN FOR OUR FUTURE

SLIDE 7

This slide extends our projection for our insulation business through 1987. The projections are very conservative compared to the opportunity. They are based on many of the existing barriers remaining.

Home Insulation

Higher levels of energy efficiency as demonstrated in the Saskatoon "Parade of Homes" will require about double the amount of insulation used in best practice now. So, providing some of the existing barriers are removed, we have a strong growth to look forward to over the next few years. As mentioned previously, the greatest opportunity, by far, exists in retrofitting the present housing stock.

Research & Development

We have been listed in the top 50 companies in Canada in R&D expenditures. We have a group of approximately 100 well trained people working on product and process development. These slides will show two or our recent developments in the residential insulation area.

SLIDE 8

"GLASCLAD" is an insulating sheathing board which is gaining acceptance in the market-place. Combined with standard wall insulation, it provides a high resistance wall system as well as an effective wind and rain barrier.

SLIDES 9 & 10

"BASECLAD" will be on the market early in the year to provide a combination of an exterior basement insulation and an effective water drainage path leading directly into the weeping tile, thereby keeping basements dry. This single problem is responsible for the majority of complaints and call-backs experienced by builders today.

Commercial & Industrial

For our industrial products the largest single market will undoubtedly come from the resource based industries and their mega-projects. One of them is now making enquiries about the manufacturing capability of the insulation industry to support their contemplated $30 billion program.

Then, of course, oil pipe lines from the north require insulation in large quantity which will demand some innovative approaches on our part.

Fiberglas Reinforced Plastic has a very significant role to play in future energy conservation. The weight saving over metals is finding increasing use in automobiles and trucks. Uses in door panels, body parts and mechanical parts are now being extended into itemes such as bumpers, leaf springs and drive shafts.

The light-weight, non-corrosive features make it an ideal material for such items as solar collectors and wind turbines. New, innovative applications will continue to provide a growing market.

HOW CAN THE INDUSTRY TAKE BETTER ADVANTAGE OF THE MARKET

The market is already there. However, there are complex barriers to overcome, some of which I will mention.

1. The lack of recognition by the general public concerning the implications of higher energy costs.

2. The deterrent to investment in energy conservation improvements because of high interest rates.

3. Difficult marketing problems facing builders in adding to the cost of houses through energy conservation improvements.

4. Short term outlook by buyers who expect to move in 2 to 4 years.

5. The lack of any co-ordinated regulations concerning energy conservation.

   The only reference to insulation in the 1980 National Building Code states that sufficient insulation must be used to prevent condensation.

   Alberta, where the cost of energy to the home owner is least, is the province which has recently incorporated the highest insulation standard. The other provinces are either well behind in their standards or have no standard at all.

6. The ineffective distribution of information to the general public about what is available through CHIP and other programs and how to apply for assistance.

7. Lack of competent, reliable companies to advise home owners what should be done and to provide the necessary services. The public has reason to be suspicious of the integrity of many who have been attempting to take advantage of the situation.

8. Lack of knowledge and training in the design and construction of energy efficient homes.

It is evident that there is much to be done to develop the market. In quick summary, I would recommend the following:

FOR GOVERNMENTS

1. For New Residential Construction - Devise an incentive program for builders which will increase the levels of energy efficiency to the demonstrated Saskatoon levels. The incentive period should be sufficient to demonstrate the application of present technologies on a broad scale, to train builders and tradesmen and to determine a level of mandatory standards which would then be implemented. If it is determined later that such standards are not needed, all the better.

2. For Existing Houses - Modify the existing CHIP program and improve the methods of disseminating information to the public.

3. Embark on a massive public awareness program to develop a demand side requirement.

4. Provide adequate incentives to create an economic reason for applying the same logic to commercial and industrial buildings.

FOR INDUSTRY

1. Provide information to the builders on energy conservation technologies and their application.

2. Provide competent energy audit and renovation services.

3. Provide innovative products and systems through application oriented R&D.

   e.g. - Total space conditiong systems for low energy input houses.

4. Provide a stronger interface with governments to ensure that programs meet the overall need.

As a final note it may interest you to know how Canadian glass fiber insulation prices compare with the rest of the world.

SLIDE 11

This slide shows that Canadian prices are lowest of any. The Scandinavian countries, the United States and Japan are next. European prices are approximately double those in Canada while Australia is selling similar products for 3½ to 4 times our prices.

Obviously our pricing cannot be the deterrent to the energy conservation process.

It is obviously going to require an increased level of determination and a sincere willingness to co-operate in order to dismantle the complex barriers which exist today.

APPENDIX E

POST-SEMINAR QUESTIONNAIRE

December 28, 1981

Dear Seminar Attendee:

On behalf of Middleton Associates and the Conservation and Renewable Energy Branch of Energy, Mines and Resources Canada, I would like to thank you for your participation in the seminar on "Energy Conservation -- Retrospect and Prospect" on December 2nd.

You will be receiving a report on the seminar, including material presented in workshops and plenary sessions, within a month or so. In the meantime, we would very much appreciate it if you could take the time to complete the enclosed short questionnaire on the seminar and return it to us in the enclosed envelope by January 11, 1982. The results of the questionnaire will be summarized in the report.

We have received to date a certain amount of informal response to the Seminar. However, we would like to have a more comprehensive indication of people's reactions, comments and suggestions to assist us in assessment of the Seminar and in the planning of future seminars, conferences, and other activities related to the promotion of energy conservation in Canada. This evaluation aspect is part of our overall contract for the Seminar.

Your assistance will be greatly appreciated. And thanks again for taking the time to participate in "Energy Conservation -- Retrospect and Prospect".

Best wishes for the holiday season,

Yours truly,

Brian Kelly

Brian Kelly

QUESTIONNAIRE

POST-SEMINAR EVALUATION:

"ENERGY CONSERVATION--RETROSPECT AND PROSPECT"

1. Overall, how worthwhile did you find the seminar in terms of your own interests in the energy conservation field? (Please circle one)

Very Worthwhile	worthwhile	Somewhat worthwhile	Not very worthwhile	Not at all worthwhile

2. What could have been done differently, in your opinion, to make the seminar more worthwhile?

_____

_____

_____

_____

3. Do you think the Department of Energy, Mines and Resouces should sponsor more such events?

YES_____ NO_____

If yes; should they be:

_____a) larger conferences

_____b) smaller seminars

_____c) other _____

4. Do you think that organizations other than EMR should sponsor such events?

YES_____ NO_____

If yes;

a) which organizations?_____

b) what subjects?_____

c) what format?_____

5. If further conferences or seminars on conservation are held, what recommendations do you have about structure, subject matter, participants, etc?

_____

_____

_____

_____

_____

6. Are there other information-related activities in the conservation field you think Energy, Mines and Resouces should be supporting or undertaking? If so, what are these?

_____

_____

_____

_____

7. Any other comments about "Energy Conservation--Retrospect and Prospect" you would like to make.

_____

_____

_____

_____

_____

_____

Note: Please feel free to use a separate sheet(s), if necessary, for questions 2 to 7.

(OPTIONAL)

Name _____

Title _____

Organization _____

Please return to: Seminar Feedback
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Ottawa, Ontario K1S 4G8